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OPERATION "ANVIL"

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7 January 1944

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COMBINED CHIEFS OF STAFF

OPERATION "ANVIL"

Reference: a. FAN 283

Note by the Secretaries

The attached report of General Eisenhower, is circulated for consideration by the Combined Chiefs of Staff.

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H. REDMAN,

F. B. ROYAL,

Combined Secretariat.

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ENCLOSURE

ALLIED FORCE HEADQUARTERS
Office of the Commander-in-Chief

28 December 1943

SUBJECT: Operation ANVIL

TO : Combined Chiefs of Staff

1. In accordance with your directive transmitted to me in FAN 283, I forward herewith an outline plan for Operation ANVIL.

2. In view of the changes of command in this theater and in the European theater, it has not been possible, as yet, to get the approval of General Wilson as Commander-in-Chief Allied Forces. Moreover, I do not wish to approve this plan in the capacity of Supreme Commander Allied Expeditionary Force until I have had the opportunity of discussing it with the COSSAC staff. On the other hand, I have thought it wise to transmit this outline plan so that you may have the opportunity of examining it and determining its implications before receiving formal confirmation by AFHQ and COSSAC Headquarters.

3. You will note that the outline plan embraces, in effect, two plans:

- a. One based upon the assumption that assault craft and shipping for two divisions will be available as now allocated.
- b. A second based upon the assumption that this allocation will be increased sufficiently to permit of an assault by three divisions.

/s/ DWIGHT D. EISENHOWER
General, U.S. Army

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Copy to: British Chiefs of Staff
Chief of Staff to the Allied Supreme Commander

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SPECIAL NOTE

1. ANNEX "I," SECTION III (Additional Resources required from outside the MEDITERRANEAN Theater) must not be taken as constituting executive request for the provision of the items detailed, except in the case of the additional assault shipping and craft required for a three divisional assault.

When final decisions are made as a result of detailed planning, definite requests for the provision of requirements will be submitted through normal channels.

2. The Service Troops required to implement Operation ANVIL are NOT detailed at ANNEX "I," but are now the subject of negotiations between AFHQ and WASHINGTON.

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22 December 1943.

OPERATION ANVILSECTION I - APPRECIATION1. OBJECT.

To prepare outline plans for an operation in conjunction with OVERLORD against Southern FRANCE, target date at the beginning of May 1944, with a lift for an assault of two or three divisions respectively and a planned build up to a total of ten divisions, with provision for subsequent exploitation northwards.

2. ASSUMPTIONS.

- a. On the mainland of ITALY, the Allies are confronting the PISA-RIMINI line and as a result we are not in possession of the port of LEGHORN. To the extent possible without detracting from ANVIL, pressure is being maintained in ITALY.
- b. Other forces in the Mediterranean are not engaged in offensive operations.
- c. Internal security in North AFRICA is not a limiting factor in assessing availability of U.S. and French divisions.

3. COSSAC CONSIDERATIONS.

COSSAC stipulates the following conditions in preparation of ANVIL:

- a. No amphibious assault may be launched prior to D-day OVERLORD.
- b. That forces should exploit northwards towards LYON and VICHY, a distance of about 225 miles.
- c. That, if possible, one or more Allied divisions should form part of the assault force.

4. NEED FOR A PORT.

The scale of operations will necessitate the development of a base at an existing, and adequate port in Southern FRANCE. (Details of ports are at Annex A.)

5. TERRAIN AND COMMUNICATIONS.a. General.

At Annex B is a study of the terrain and communications of Southern FRANCE. The following conclusions are drawn:

- (1) An advance eastward toward the RHONE Valley from the vicinity of SETE would pass through defiles between hills and lagoons as far as MONTPELLIER, whence deployment would be possible though restricted locally by small streams, large canals, and coastal marshes.

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- (2) An advance westward toward the RHONE Valley from the vicinity of TOULON would have little choice of route, the main road and railway being strongly canalized at or near the coast, but from AIX a number of roads and railways fan out northward and westward, with possibility of increased deployment.
- (3) Deployment of armored formations is possible in the "Crau" region of the RHONE Delta, west and northwest of MARSEILLES.
- (4) The middle RHONE Valley as far as LYON is a topographical defile very unsuited to use of armored forces.
- (5) An advance on LYON will parallel one main road and one railway on each side of the valley, in addition to large canals associated with the RHONE River system.
- (6) Owing to its turbulent swift current, the RHONE River will constitute a major bridging obstacle.

b. Beaches.

At Annexes D1 and D2 are maps of the beaches in Southern FRANCE. The only areas in which large scale landing operations could be carried out are as follows:

(1) West of SETE.

Adequate extent of beach exists in this area but landing craft would be limited by bad gradients, and movement inland restricted by the numerous lagoons and marshy areas.

(2) Southeast of MARSEILLES.

Two miles south of the port of MARSEILLES, 3100 yards of shingle beach backed by a formidable anti-tank wall.

(3) TOULON - Le LAVANDOU area.

A long sand and shingle beach approximately 12 -15 miles east of TOULON extends for about four miles forming the western and northern shores of RADE D'HYERES. The most useful portion of this beach is backed by a large anti-tank ditch.

To the east and south of this long beach are several small embayed beaches, also two beaches in RADE DE BORMES (south of Le LAVANDOU).

If all these were used, a large force of all arms could be landed in the area.

(4) Le LAVANDOU - ST. RAPHAEL.

Several beaches, many of which have sea walls and lack suitable exits, are backed by high country. Some work would be required before these beaches could be used for large scale landings.

The principal beaches are at BAIE de CAVALAIRE, ANSE de PAMPELONE and the smaller beaches near ST. MAYIM.

(5) CANNES area.

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There are two beaches in this area on either side of the town. To the west the GOLFE DE NAPOULE and to

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the east CANNES beach. Both beaches are backed by seawalls. Movement inland is liable to be difficult owing to rugged terrain.

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6. COAST DEFENSES.

From a study of the map showing coast defenses (Annex D2), the following conclusions may be drawn:

a. Coast excluding PERPIGNAN to excluding MARSEILLES.

Generally, the defenses of this stretch are comparatively light, consisting of barbed wire, minefields and occasional emplacements for automatic weapons. The ports of SETE and PORT DE BOUC are however each well defended by coast defense artillery, while small concentrations of coast artillery are also sited at CAP LEUCATE, LA NOUVELLE, AGDE and GROS DU ROI.

X b. MARSEILLES.

Both north and south of the port there is a very heavy concentration of coast artillery. The beach defenses between MALMOUSQUE and LA MADRAGUE are the most formidable in the entire section now under review.

c. LA MADRAGUE to CAP SICIE.

The defenses are concentrated chiefly in the bays of LA CIOTAT, BANDOL and SANARY. These bays are fairly well defended by wire, anti-tank obstacles and emplacements for heavy automatic weapons and anti-tank guns, and their flanks are covered by light or medium coast artillery.

d. TOULON.

There is a heavy concentration of coast artillery covering the immediate approaches. Heavy automatic weapons are sited on the piers in the port itself. Owing to the poor nature of the beaches the beach defenses are not strong.

e. GIENS peninsula and RADE D'HYERES.

Coast artillery in this area is strong, positions being sited on the mainland and the islands. The beach defenses are not very strong except immediately SE of HYERES where there is an anti-tank ditch, wire and a fair concentration of pillboxes and casemates. The beach defenses of the islands are very slight.

f. C.BENAT to the Italian frontier.

East of the RADE D'HYERES the defenses are Italian built and on the whole not very strong. There are however concentrations of coast artillery in the CAP CAMARAT area, at ST. RAPHAEL/FREJUS, and at CANNES and NICE with the usual system of barbed wire, and anti-tank walls and pillboxes supported by light or medium artillery and anti-tank guns.

7. WEATHER.

An appreciation of the weather conditions to be expected on the South coast of FRANCE in May is attached at Annex C. This shows that strong northwesterly winds (Mistral) occur on about one day in every four in the Gulf of LIONS, i.e. west of TOULON, but that their strength and frequency decrease considerably along the Riviera coast east of TOULON. The incidence of onshore winds increases eastward from TOULON, but they are generally of less strength and frequency than the Mistral winds.

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8. AIR CONSIDERATIONS.

- a. Fighter protection can be provided by shore based fighters operating from CORSICA to cover an assault anywhere east of MARSEILLES (incl.) Even in this area however carrier based fighter cover may be necessary to supplement land based fighters.
- b. It is essential that an airfield in the South of FRANCE should be in our possession by D + 2 or serious difficulties may be expected in the provision of air cover. Failing an existing airfield at least one fighter strip should be constructed by D + 2, or at the latest by D + 3.
- c. Medium bombers and transport aircraft could be operated anywhere over the area under consideration from CORSICA or SARDINIA.
- d. Weather conditions in Western Mediterranean area are likely to be favorable for air operations during May.
- e. At Annex E are details of the airfields, landing grounds, and seaplane bases in Southern FRANCE.

Annexes D2 and E show that the following airfields are located sufficiently close to the potential landing beaches to offer possibilities of being captured by D plus 2. Many of these airfields are subject to possible artillery fire from commanding heights overlooking the airfields. There also remains the possibility of thorough destruction of the fields by the enemy. Therefore operation of these airfields immediately after capture is doubtful.

An asterisk marks the fields which are most likely to be suitable for operation soon after capture:

*HYERES/PALIVESTRE
CUERS/PIERREFEU
ISTRES/GROUPE I
ISTRES/LE TUBE
ISTRES/LES PATIS
ISTRES/LE VERREY
RETOUR DES AIRES
*MONTPELLIER/FREJORGUES
*PERPIGNAN/LA SALANQUE

9. PORTS.

At Annex A is a study of the ports in the area. The necessity for the possession of a large port limits the selection to:

SETE
MARSEILLES
TOULON

SETE is the smallest in capacity (7,000 - 8,000) tons per day. It is approached through canals which are very easily blocked, and the exits from the port are difficult. This port is therefore considered as unsuitable for development as a main base.

MARSEILLES is capable of handling more than enough to deal with the total requirements of the force. Moreover its facilities are not easily destroyed, though the entrance to the port might be temporarily blocked.

TOULON, while its port capacity would be satisfactory to support the force in its initial stages, suffers from bad clearance facilities which can easily be made much worse by demolitions.

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It is therefore concluded that while the use of TOULON and the beaches must permit maintenance of sufficient forces for the holding of the bridgehead and for the advance on MARSEILLE, the use of the latter port will be essential as a main base port for the exploitation northwards.

TOULON is 45 miles and SETE is 150 miles from MARSEILLES.

10. SELECTION OF THE ASSAULT AREA (For details of beaches see Annexes D1 and D2).

a. The foregoing examination, insofar as it affects the selection of the assault area, may be summarized as follows:

- (1) The early capture of a major port is essential. Of the three major ports SETE is unsuitable, TOULON will suffice temporarily as a base, MARSEILLE must eventually be developed as the major base.
- (2) The only beaches suitable for a large force are west of SETE or east of TOULON.
- (3) The incidence of strong winds decreases considerably to the eastward of the Gulf of LIONS.
- (4) The early capture of an airfield or the construction of fighter strips is essential.
- (5) Shore-based short range fighter cover cannot be given to an assault anywhere west of MARSEILLES.

b. From these considerations it is clear that the assault must take place east of TOULON where the only three areas of beach which merit consideration for the launching of a large force are situated:

RADE D'HYERES
CAVALAIRE - east of CAP CAMARAT
CANNES

- c. There is an airfield in the CANNES area. It might be possible to capture it early in the operation. However, beaches in this area are protected by a seawall, are some 70 miles from a suitable port, and are backed by high ground with comparatively poor communication inland and westwards.
- d. There is no airfield in the CAVALAIRE - CAP CAMARAT area which could be captured by D + 2, though strips for fighters might be constructed. The area is some 30 miles farther east of TOULON than the area of the RADE D'HYERES. Suitable beaches exist in this area, but anchorage space is limited by the depth of water there.
- e. The RADE D'HYERES has the serious disadvantage that an assault in the area is unlikely to achieve tactical surprise owing to the islands flanking the approach. Furthermore, the approaches to the RADE are easily mined and are strongly defended with coast artillery, and the western beaches of this area are backed by an anti-tank ditch. None of these difficulties, however, is considered to be insuperable. This area has the following advantages:

- (1) It is within 20 miles of TOULON.
- (2) There is an airfield close at hand.
- (3) The islands and the formation of the mainland form a good anchorage for a large number of ships, well protected from the Mistral winds.

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- (4) The entrances will be comparatively easy to defend against U-boat attack.
- (5) The beaches are adequate for a large force. Some of them are of good gradient and on the whole the exits are good.
- (6) It may be possible to make a strip for fighters on one of the islands.

CONCLUSION.

IT IS CONCLUDED THAT THE RADE D'HYERES MEETS ALL OUR REQUIREMENTS, ESPECIALLY THE REQUIREMENTS FOR A LARGE IMMEDIATE FOLLOW UP THROUGH THE BEACHES, PROVIDED THAT THE INITIAL DIFFICULTIES OF AN ASSAULT THERE CAN BE OVERCOME. SHOULD THE DEFENSE OF THE RADE PROVE TO BE SO STRONG AS TO MAKE AN ASSAULT THERE TOO HAZARDOUS, THE CAVALAIRE - CAP CAMARAT AREA WOULD SERVE AS AN ALTERNATIVE.

11. POSSIBLE STRENGTH AND DISPOSITIONS OF ENEMY FORCES.

a. Ground

(1) Initial:

It is estimated that, if present Allied action continues to stretch enemy resources between the present time and the date ANVIL is launched, the enemy will have up to seven infantry divisions defending the southern coast of FRANCE, each division on a front of 30 to 40 miles, and up to two mobile divisions either armored or motorized in favorable localities for an early counter-attack role. Further, Northern ITALY must be considered as a source of reinforcement for the South of FRANCE, hence it is possible that one mobile division may be found from that area.

(2) Build-up:

Under the above conditions the enemy build-up may be as follows:

<u>Period</u>	<u>Arriving during Period</u>	<u>Available End of Period</u>
D		1 Inf Div
D to D plus 4	1 Mobile Div Elements 1 Inf Div	Equivalent 1-2 Inf Divs and 1 Mobile Div
D plus 5 to D plus 10	1 Mobile Div Equivalent 1 Inf Div	Equivalent 3 Inf Divs and 2 Mobile Divs

NOTE: Up to 2 to 3 Para Bns may also have to be reckoned with at any time during the above period. Their initial location and the available lift will dictate times of their entry in the battle.

It is not possible to estimate further reinforcement after D - 10. This will depend largely on the internal security problem and the progress of Operation OVERLORD.

b. Naval:

- (1) The operation will differ from any previous amphibious operations in the MEDITERRANEAN in that no interference by an enemy battle fleet is possible. It is possible but unlikely that by next May the enemy may have manned some ex-French and Italian cruisers and destroyers which are in his hands (See Annex G) in which case opposition might be on a noticeable scale for some of them are

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likely to be based at TOULON and will have little choice but to scuttle or fight. However, the gun support cruisers and destroyers which will accompany the expedition will be adequate to give good cover against them.

- (2) Confirmation as to whether or not the enemy intends to man any more cruisers or destroyers should be available by the time that detailed planning begins.
- (3) The scale of U-boat threat is likely to be heavy in the early stages of the operation, for we shall be operating close to the enemy's main MEDITERRANEAN U-boat base. Subsequently, the enemy will be forced to withdraw his U-boats and base them elsewhere, where adequate facilities are unlikely to be available for them. From then on the U-boat threat in the Western Basin should be almost eliminated.

c. Air:

For details of enemy air disposition and scale of attack see Annex F. The enemy are in possession of a large number of first class airfields in Southern FRANCE (see Annexes D2 and E), but many of these fields have been obstructed in such a manner that it is reasonable to assume that the enemy has permanently abandoned them. Nevertheless there are sufficient airfields available to permit a strong concentration of enemy air effort against an assault anywhere between PERPIGNAN and CANNES.

The enemy air strength in the area of the assault however is likely to be weak, having regard to his commitments on the Western and Russian fronts, and his general weakness in the air.

12. OWN FORCES

a. Ground:

- (1) At Annex H are details of dispositions of our ground forces, in the Western MEDITERRANEAN including ITALY, as expected at 1 April 1944.
- (2) Some French divisions must necessarily be included in the force. In order therefore to simplify organization and administration, it is considered that the balance of the force should be US, since the French are equipped with US equipment and organized on US establishments.
- (3) A minimum of 15 infantry divisions must be retained in ITALY in order to provide for security. This number will permit the withdrawal of at least three battle tested divisions for the assault and one for the follow up.
- (4) Annex B (Terrain and Communications) makes it clear that the area in which exploitation is to be undertaken is not favorable for the deployment of large armored formations. As a result it is considered that the composition of the force should be in the ratio of:

8 Inf Divs
2 Armd Divs

Such a proportion will not in any way prevent small armored elements being employed in the assault, should the Commander so desire.

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- (5) It is impossible at this stage to say definitely what proportion of US troops should form the US element of the 10 divisions, but it is likely to be three or four US Inf Divs. The balance of the force would be French.
- (6) The Army HQ required for controlling this operation could be HQ 7th Army US.
- (7) Estimated requirements for considerable additional forces to implement the outline plan are at Annex "I".

b. Air:

The air forces likely to be in the MEDITERRANEAN will meet the requirements of the operation. The following qualifications are, however, necessary:

- (1) All or part of the bombing effort of the Fifteenth Air Force (Strategic) will be required to support the operation.
- (2) It will almost certainly be necessary to utilize long-range fighters of the Fifteenth Air Force to assist in providing fighter cover during the initial stages of the assault.
- (3) The Troop Carrier aircraft scheduled to remain in the Command (three Groups) will only permit of a very small airborne lift. If an airborne operation exceeding this capacity is planned, a corresponding increase in strength of troop carrier aircraft will be necessary.
- (4) The shortage of fighter bombers due to the fading out of the types which have fulfilled this role up to now (A-36, P-38, P-40), may prove a handicap in the operation. It is not yet clear whether the Spitfire and the P-51 will meet the requirement, and whether or not the P-47 can be used successfully in this role.
- (5) The withdrawal of any fighter units from this theater may jeopardize the provision of air cover for the assault.

c. Navy:

The necessary naval forces can be provided mainly from MEDITERRANEAN resources. The exact requirements will depend upon the plan which is adopted.

13. BUILD-UP

At Annex J are details of the build up which it is estimated should be obtainable. The results of this examination show that build up might be:

a. With assault shipping and craft for two divisions:

- 2 divisions ashore on D day
- 5 divisions ashore by D + 3 (@ 25,000 men and 4,000 vehicles per division)
- 6 divisions ashore by D + 12
- 10 divisions ashore by D + 80 (@ 45,000 men and 8,000 vehicles per division)

b. With assault shipping and craft for three divisions:

The force landed in the D day to D + 3 period can be increased to about 5½ divisions, and the build-up to 10 divisions can be completed by about D + 68.

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14. ASSAULT AND STAGING

To achieve the rapid early build-up it will be necessary for all the first five divisions to be embarked prior to D day. The loading of so large a force will employ virtually all the port facilities in the Western Mediterranean and ITALY that are not essential for routine maintenance.

The assault divisions can and should be battle-trained divisions which are at present located in ITALY. To avoid an unnecessary move, therefore, the assault divisions should be mounted in the ITALY/SICILY area. This procedure has the advantage that the concentration of LST and LCT in ITALY, especially in the Heel ports, will be observed by the enemy and may be construed by him to be a threat to the BALKANS or to the flanks of his line in ITALY.

LCT and LCI used in the assault will stage in the SARDINIA/CORSICA area.

Of the immediate follow-up divisions, it will probably be necessary to load one in Italian or Sicilian ports. The remainder of the follow-up divisions will be located in French North AFRICA and must be mounted from there, except in the case of one French division which will come from CORSICA.

15. ADMINISTRATION

At Annex K is an administrative appreciation of the operation. The conclusions which can be drawn from a study of this annex are:

- a. The first essential administrative requirement after landing is a firmly established bridgehead sufficiently distant from the beaches to provide security and space for deployment and operation of depots. To this end, the seizure of the Le Coudon Area on the left flank at the earliest moment would assist the deployment of the Beach Groups.
- b. The ground in rear of the landing beaches does not facilitate rapid deployment of Beach Groups without preliminary Engineer work to provide crossings over ditches, railways and irrigation channels. Some areas in rear of the beaches are limited in extent by hills. The acceptance on shore of follow-up divisions at the quickest rate possible, as outlined in Annex J, will therefore be dependent on two main factors:
 - (1) the rapid establishment of an adequate bridgehead to afford deployment areas to the administrative services, and
 - (2) the speed with which the Beach Groups can be deployed clear of roads and beaches, thus avoiding congestion of stores and vehicles.
- c. The organization of Beach Groups, and the maintenance of the subsequent advance, will necessitate the provision of additional Service Troops beyond the resources of this theater. (These troops are specified in Annex "I".)
- d. By means of Beach maintenance, given above conditions, it should be possible to support the initial assault for a distance of 20 miles, which will cover capture of TOULON. Operation of this port will be necessary to facilitate further advance.

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- e. The early capture and operation of a port are necessary to provide maintenance for our forces. If operations are directed initially against TOULON, that port can be used. Upon the capture of MARSEILLES, this port must be developed as the main base port for the operation.
- f. It is considered that the mounting of up to four divisions from ITALY and SICILY in landing craft and MT ships should be possible without critical interference with the requirements of the forces in ITALY at the time of embarkation.

16. RESISTANCE MOVEMENTS

In this operation we shall be landing in a country whose civilian inhabitants are at least potentially friendly, and where considerable armed resistance groups have, over the last three years, been organized. It is likely that such resistance groups will be in a position to slow up the movement of enemy build up capable of being brought against the assault and cause considerable confusion to the Germans. While resistance by these armed groups will without doubt be useful, for planning purposes no reliance should be placed on their ability to help the operation. Any assistance which they render should be looked upon as a bonus.

17. ACTION AFTER THE ASSAULT

The form of operations once the assault has got ashore is likely to fall into three phases:

- Phase I - Establishment of a bridgehead round the assault area.
- Phase II - Extension of a secure bridgehead to include the port of TOULON.
- Phase III - Operations to secure the port of MARSEILLES.

It is considered that any major exploitation northwards is likely to have to await successful conclusion of the above three phases.

18. CONCLUSIONS

The following conclusions on which to base the outline plan may be drawn from the appreciation:

- a. The early capture and operation of a port are necessary. TOULON would suffice as an interim base, but MARSEILLES must be captured with a view to development as the main base.
- b. The use of carrier borne aircraft may be required to supplement any shore based fighter cover.
- c. An airfield must be captured by D + 2¹/₂, or at least one fighter strip constructed by D + 2 or D + 3.
- d. An assault in the RADE D'HYERES offers the best prospects for success. If between now and D day for ANVIL the Germans should construct defenses in this area as to make a landing impracticable an alternative area for the assault would be CAVALAIRE - CAP CAMARAT.
- e. The composition of the ten division force should be in the ratio of eight infantry divisions and two armored divisions.
- f. The necessary ten divisions can be made available; this will still leave sufficient formations for security in ITALY.

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- g. The assault should be made with battle tested formations which will be available and as far as possible follow up formations should be battle tested.
- h. The assault would be most advantageously mounted from the ITALY - SICILY area.
- i. Up to four divisions could be mounted from the ITALY - SICILY area without serious repercussions on the administrative maintenance of the Italian battle.
- j. With the special shipping and craft allotted to the MEDITERRANEAN, some five divisions at 25,000 men and 4,000 vehicles per division can be landed by D + 3, provided a large additional allotment of MT ships and, possibly, some personnel ships are available; the whole force of ten divisions at 45,000 men and 8,000 vehicles per division can then be landed by D + 80, after which the increased MT ship allocation can be released.
- k. In order to compete with the estimated rate of enemy build up against the assaulting force, a rapid build up on our part is required.
- l. Any help which resistance groups can give should be looked upon as a bonus.
- m. It will be necessary to establish a firm base on the south coast of FRANCE prior to initiating exploitation to the North.

19. OUTLINE PLAN

Section II, attached hereto, is an outline plan of one method by which the ANVIL operation might be carried out.

It is intended that this appreciation and outline plan should form a guide to the Commander entrusted with the operation.

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ALLIED FORCE HEADQUARTERS

24 December 1943

SECTION II

OUTLINE PLAN FOR OPERATION ANVIL

1. Two plans are submitted:
 PLAN A for an assault of two divisions.
 PLAN B for an assault of three divisions.
2. The plans are divided into:
 PART I Preliminary Phase.
 PART II Preparatory Phase.
 PART III Assault and capture of a port.
 PART IV Operations after the capture of a port.

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Enclosure

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ANVIL OUTLINE PLAN

The map referred to throughout this outline plan is 1:50,000 FRANCE Enlargement, (G.S.G.S. 4040B).

The grid on this map is not the same as that on the 4040A series.

PART I - PRELIMINARY PHASE (Common to Plans A and B)

1. This phase is already in being. All efforts are being directed to carrying out such air action (especially POINT-BLANK), sea action, propaganda, political and economic pressure and sabotage as is calculated to soften the degree of German resistance.

PART II - PREPARATORY PHASE (Common to Plans A and B)

1. a. Air action prior to the assault.

Air action to neutralize the enemy air forces by the bombing of airfields within effective range of the assault area will be initiated approximately D - 42, continued and intensified as necessary up to and throughout the operation.

A bombing program designed to assist the operation and impair the enemy's ability to counter the assault will also be undertaken. Care will be necessary not to jeopardize surprise. Photographic and reconnaissance requirements will be completed during this phase, and a counter-radar program initiated at the appropriate time.

As D-day approaches, there must be a withdrawal of air forces from other commitments, except those of a purely defensive character, in order to insure that the maximum effort can be exerted in support of the ANVIL operation during the initial phase.

- b. Naval and ground action during this period calls for no comment.

PART III - ASSAULT AND CAPTURE OF A PORT

TIMING.

1. The final decision as to the timing of the ANVIL assault must be the result of consultation with COSSAC.

It was agreed with COSSAC before SEXTANT that no expedition should sail for Southern FRANCE until it is known with certainty that OVERLORD is sailing from UK. On this assumption the ANVIL assault would not take place before OVERLORD D + 3 to D + 4.

DIVERSIONS.

2. All available assault shipping and craft will be required for the main assault; therefore none will be available for staging any major diversionary operations.

This will not preclude minor diversions which will be for consideration during detailed planning.

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NEUTRALIZATION OF DEFENSES.

3. Owing to the fact that area selected for the assault (RADE D'HYERES) is flanked by a series of defended islands it will be necessary for the defenses on these islands to be neutralized before the assaulting forces can be landed on the beaches.

Subsidiary landings by Commandos and Rangers would be undertaken both on these islands and on the mainland in the CAP BENET area (and possibly at CAP NEGRE for Plan B) prior to the assault with a view to neutralizing the defenses thereon.

AIR OUTLINE PLAN.

4. Air cover during the approach and the assault will be provided by land based fighters operating from CORSICA and possibly SARDINIA, possibly supplemented by aircraft operating from aircraft carriers. Bombing attacks against enemy airfields will be continued as necessary as a primary requirement. All other fighter-bomber and bomber effort available will be directed against targets selected with a view to assisting the assault and impeding the enemy's counter-measures. It will be difficult during this phase for fleet-ing or other targets to be attacked at short notice on call.

Reconnaissance and photographic reconnaissance requirements will be met. Anti-submarine, counter-radar, and other planned programs will be put into effect. Airborne operations, if required, can be undertaken up to the capacity of the Troop Carrier units in the Command.

At Appendix 1 to these plans is a brief appreciation as to a method of operating escort carriers in this operation.

NAVAL OUTLINE PLAN.

5. Since no opposition is possible from an enemy battle fleet, the main feature of the naval plan is the convoy program necessary to meet the requirements of the assault and follow up. Outline convoy program for Plans A and B are attached at Appendix 2. This Appendix also shows the escort requirements for the two plans, including the requirement for a force of four escort carriers.

Provision must also be made for fire support by naval gunfire. It is expected that one old French battleship; some twelve British, American and French cruisers, light cruisers and contre-torpilleurs, and the equivalent of a flotilla of destroyers, will be available for this purpose.

This force will also provide cover against any interference with the assault forces by enemy light naval forces.

ARMY OUTLINE PLAN. (See Map At Appendix 3.)

6. a. The Assault.

- (1) Pre H-hour action. (Common to Plans A & B.)

Commandos or Rangers will land from assault craft to neutralize the defenses in the areas:-

CAP BENAT
Ile de PORQUEROLLES
Ile de PORT CROS
Ile de LEVANT
GIENS

CAP NEGRE (in case of three div assault)

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(2) Plan A (Two divisional assault)

(Ref map FRANCE 1:50,000 (Enlargement) Sheets
248 NW. SW. NE. SE.)

Landing.

(i) Two simultaneous assaults will be made:-

(a) One division on Western beaches of
RADE D'HYERES.

(b) One division on Northern beaches of
RADE D'HYERES.

The approximate assault areas are shown on the map
at Appendix 3 to the plan. Exact areas can only be
decided as a result of detailed examination of the
beaches.

(ii) Each assaulting division will be on a two RCT
front. An immediate follow-up will consist of
the third RCT of each assaulting division, plus
one further RCT from the Corps.

(iii) Each RCT landed in the assault and immediate
follow-up will have a proportion of tanks.
(10 approx)

Object.

To establish a bridgehead in two phases:-

Phase I -- To be captured by D + 1.

General Line -- See map at Appendix 3.

Phase II -- To be captured by D + 2.

General Line -- See map at Appendix 3.

(3) Plan B (Three divisional assault)

(Reference map as for Plan A)

Landing.

(i) Three simultaneous assaults will be made:-

(a) One division on Western beaches of
RADE D'HYERES.

(b) One division on Northern beaches of
RADE D'HYERES.

(c) One division in the CAP BENAT area.

The approximate assault areas are shown on the
map at Appendix 3, attached to this plan. Exact
areas can only be decided as a result of detailed
examination of the beaches.

(ii) Each assaulting division will be on a two RCT
front. An immediate follow-up will consist of
the third RCT of each assaulting division.

(iii) Each RCT landed in the assault and immediate
follow-up will have a proportion of tanks. (10)

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Object.

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To establish a bridgehead in two phases.

Phase I -- To be captured by D ÷ 1.

General Line -- See map at Appendix 3.

Phase II -- To be captured by D ÷ 2.

General Line -- See map at Appendix 3.

b. Build-up.

Ground.

A very rapid initial build up is necessary to give greater insurance for a successful operation. This is achieved by using LST after they have landed their initial load, to ferry vehicles ashore from two successive flights of preloaded MT ships.

It is estimated that build up may be in the order of:-

With assault shipping and craft for two divisions:

- 2 divisions ashore on D-day.
- 5 divisions ashore by D ÷ 3 (@ 25,000 men and 4,000 vehicles per division)
- 6 divisions ashore by D ÷ 12
- 10 divisions ashore by D ÷ 80 (@ 45,000 men and 8,000 vehicles per division)

With assault shipping and craft for three divisions:

The force landed in D-day to D ÷ 3 period can be increased to about $5\frac{1}{2}$ divisions, and the build-up to 10 divisions can be completed by about D ÷ 68.

Air.

The rate of build up will depend upon the rate of advance of land forces and the availability of airfields. It is the intention to attain as rapid a build up as possible of fighter and fighter-bomber units, followed by light and medium bomber units, if the tactical situation allows.

c. Capture of TOULON. (Common to Plans A & B)

One French infantry division and one French armored division to be landed by morning D ÷ 3. Provided the security of a satisfactory bridgehead these formations to form a striking force to exploit westwards and capture TOULON by D ÷ 5.

d. Use of Airborne Forces in the Assault. (Common to Plans A & B)

- (1) One RCT Airborne force to land immediately prior to the assaulting forces in the area of CUERS (0311), with the object of delaying enemy reinforcements of the assault area and obtaining lodgement in the extended bridgehead.
- (2) This RCT to be withdrawn immediately Phase II of the bridgehead has been established.
- (3) One RCT Airborne forces to be held as reserve.

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e. SOE/OSS Operations.

At Appendix 5 are outline plans which would be put into operation in conjunction with the main ANVIL plan.

f. Administration.

At Appendix 4 is an outline administrative plan for the operation.

PART IV - OPERATIONS SUBSEQUENT TO THE CAPTURE OF TOULON

1. The development of operations after the security of the TOULON bridgehead has been insured will necessarily be conditioned, as to timing, to a great extent by the enemy resistance and known enemy movement; our object, at this stage, will be to seize the port of MARSEILLES directly our military position vis-a-vis that of the enemy, allows us to do so.
2. Once MARSEILLES has been secured the object will be to exploit northwards with a view to gaining control of the LYON - VICHY area.

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APPENDIX 1

FIGHTER COVER FROM ESCORT CARRIERS

1. The provision of fighter cover from airfields so far distant from the assault area as those in CORSICA has one inherent weakness. By deliberately staging an air battle at the right moment, the enemy can force our fighters to return to base before their scheduled time; the gap thus caused in the otherwise continuous fighter protection cannot be immediately filled in, for the distance to be flown by relief fighters cannot be covered in less than about half an hour. During this gap a heavy bombing attack could be staged without opposition from fighters.
2. Cover from escort carriers however suffers from two even more serious weaknesses:
 - a. Ship-borne fighters cannot be a match for shore-based fighters.
 - b. The lack of reserve and maintenance facilities in the carriers prevents any high scale of effort being maintained for more than two or three days.
3. Cover from escort carriers on the other hand does not suffer from the weakness of shore-based fighters mentioned above, since the escort carriers can operate close to the assault area.
4. The solution therefore seems to be that fighter cover should be provided by land-based aircraft, and that escort carriers should be used to fill in any gaps in the otherwise continuous air cover created as a result of our fighters having to return to base before their scheduled time.
5. The carriers would make no attempt to maintain any continuous patrols. They would husband their resources as much as possible, and would hold themselves in readiness to fly off the strongest possible patrols when required to fill in a temporary gap in the shore-based air cover.

It is considered that this method of operation would:

- a. Allow much stronger patrols to be flown off than would be the case if the carriers attempted to maintain any permanent patrols.
 - b. Allow the carriers to operate for a considerably longer time.
7. It is believed that a force of four carriers would in these circumstances be sufficient to meet requirements.
 8. There is advantage in keeping the carrier force as small as possible, since the operation of carriers is bound to reduce the anti-submarine escorts available for the assault force.

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APPENDIX 2

CONVOYS AND ESCORTS

1. This Appendix contains the outline convoy program for Plans A and B, together with an assessment of the escort requirements.

2. The available destroyers and escorts based on present allotments are expected to be as follows. These figures do not include the Gibraltar or Moroccan Sea Frontier escort forces.

Fleet destroyers	16
U.S. destroyers	9
French destroyers	6
Hunts	42
Sloops, frigates and corvettes, etc.	36
French escorts	7

3. These may be classified broadly as 31 destroyers, 42 AA escorts and 43 A/S escorts, to which may be added some 24 A/S escorts consisting of PC and French and British trawlers which would be released from their present duties for the operation.

4. Provided there is no through Mediterranean fast convoy at the time of the operation, and that there are no Aegean convoys, it is estimated that the destroyer and escort commitments in the Mediterranean, other than for escort of ANVIL convoys, will be as follows:

	<u>Destroyers</u>	<u>AA Escorts</u>	<u>A/S Escorts</u>
(a) For gun support and cover duties for ANVIL	10		
(b) As a striking force in the Adri- atic and for support of the flank of the army in Italy.	4		
(c) For slow through convoys			36
(d) For supply convoys to Italy in addition to the Italian escorts.		15	
(e) As an A/S hunting group and/or AA support group in the Levant.		5	
	<u>14</u>	<u>20</u>	<u>36</u>

5. The available escorts for ANVIL are therefore:

	17 destroyers	22 AA escorts	31 A/S escorts
Required for Plan A:	21 destroyers	42 AA escorts	31 A/S escorts
Required for Plan B:	21 destroyers	51 AA escorts	31 A/S escorts

6. The additional requirements are thus:

For Plan A: 4 destroyers and 20 AA escorts.
For Plan B: 4 destroyers and 29 AA escorts.

7. In both cases the requirement would be reduced by 10 if the escort carriers were not used.

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PLAN A

Appendix 2

Escort Commitment	Area where mounted	Approx. time of departure	Arrive Assault Area	ESCORTS		
				Destroyers	AA escorts	A/S escorts
Escort Carriers	MALTA	am. D - 2	am. D day		10	
Ranger Convoy, 2 LSI & 5 LST	-	-	night D-2/D-1	3	2	
Assault Convoy, 9 LSI and 3 XAP	ITALY	D - 3	am. D day	4	5	
Assault Convoy, 11 LST	ITALY	D - 2	am. D day	5		
4 convoys each of about 20 LCT	(From ITALY (staging in CORSICA	night D-2/D-1	am. D day			4
25 LST	Eastern ITALY	D - 4	am. D day	2	2	3
25 LST	Western ITALY	D - 2	am. D day	3		4
About 35 MT ships	ITALY	D - 5	pm. D day	2	2	4
About 35 MT ships	NORTH AFRICA	D - 2	pm. D day	2	2	4
About 2 personnel ships	NORTH AFRICA	D - 1	am. D + 1		3	
4 convoys each of about 30 LCI	(From ITALY (Staging in CORSICA	D day	am. D + 1			4
About 70 MT ships	ITALY & NORTH AFRICA	D day	am. D + 2		4	8
About 14 personnel ships	NORTH AFRICA	D + 1	am. D + 3		7	
20 MT ships	NORTH AFRICA	about D+2 (Exact day dep. on Med. convoy cycle)	about D+5		5	

Subsequent convoys of 20 MT ships every 5 days can be met by assault convoy escorts on return from the assault area.

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PLAN B

ESCORT COMMITMENT	Area where mounted	Approx. time of departure	Arrive Assault Area	ESCORTS		
				Destroyers	AA Escorts	A/S Escorts
Escort Carriers	MALTA	am. D - 2	am D Day		10	
Ranger Convoy, 2 LSI & 5 LST	-	-	night D-2/D-1	3	2	
Assault Convoy, 9 LSI & 3 XAP	ITALY	D - 3	am. D day	4	5	
Assault Convoy, 11 LST	ITALY	D - 2	am. D day	3	2	
3 convoys each of about 30 LCT	{From ITALY {staging in CORSICA	Night D-2/D-1	am. D day			3
3 convoys each of about 15 LCI		D - 1	am. D day		3	
About 25 LST	Eastern ITALY	D - 4	am. D day	2	2	3
About 25 LST	SICILY	D - 3	am. D day	3		4
About 25 LST	Western ITALY	D - 2	am. D day	2	2	3
About 35 MT ships	ITALY	D - 5	pm. D day	2	2	4
About 35 MT ships	NORTH AFRICA	D - 2	pm. D day	2	2	4
About 12 personnel ships	NORTH AFRICA	D - 1	am. D + 1		6	
2 Convoys each of about 30 LCI(L)	{From ITALY {staging in CORSICA	D day	am. D + 1			2
About 70 MT ships	ITALY & NORTH AFRICA	D day	am. D + 2		4	8
About 11 personnel ships	NORTH AFRICA	D + 1	am. D + 3		6	
20 MT ships	NORTH AFRICA	about D + 2 (Exact day dependent on Med. convoy cycle.)	about D + 5		5	

Subsequent convoys of 20 MT ships every 5 days can be met by assault convoy escorts on return from the assault area.

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APPENDIX 3

(One Photostat)

MAP OF TOULON

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Appendix 3

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APPENDIX 4

ADMINISTRATIVE OUTLINE PLAN

1. Administrative Troops in the Assault.

Each of the first five divisions to land includes 12,000-14,000 men, in addition to the actual division itself, or a total of 60,000-70,000 troops (according to plan adopted) from which will be found one Beach Group of 5,000 men, plus labor, transport and Depot troops for each assaulting RCT. It is essential that in or immediately following the initial assaulting troops should be adequate reconnaissance parties to select, lay out, and determine what engineer work is urgently required in the Beach Groups and Depot Areas.

2. Maintenance Stores.

Stores will be unloaded as soon after the assault as possible, (after organization of Beach Groups on shore), and during the first five days should cover maintenance requirements up to D + 7. This will entail the handling during this period of 1,400 or 1,070 tons/day by each group according as to whether it is a two or three division assault.

From D + 5 to D + 10, maintenance requirements to D + 14 should be landed, and by D + 20 maintenance to D + 28 should be assured.

3. Capture of TOULON.

If, as is estimated TOULON can be operating by about D + 10, an initial discharge of 2,000 tons/day should be possible at that port, rising gradually according to state of clearance facilities, and proportionately alleviating discharge of maintenance requirements over the beaches.

4. Capture of MARSEILLE.

The ultimate maintenance of the force, combined with overall requirements after the force is established in FRANCE, necessitates the full development of MARSEILLE as soon as captured. To that end port operating resources should be transferred from TOULON.

5. Special Units and Equipment.

Administrative support of the operations in the initial stages when a rapid buildup of ground forces is taking place, and when it may be necessary to continue maintenance over the beaches for a longer period than has hitherto been undertaken, will necessitate not only large numbers of DUKWs and landing craft but a high standard of maintenance and adequate relief drivers and crews to keep them in continuous operation.

The further advance northward into FRANCE will require adequate numbers of Service Units to ensure maintenance by road until railways and canals can be put into operation.

The early provision for supply of gasoline by pipeline is necessary for Air and Ground Forces.

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6. Maintenance of Small Independent Forces.

Commandos or Ranger Battallions landed in accordance with paragraph 6 a of Part III should be self contained in stores and supplies for at least 48 hours. Provision of subsequent maintenance to these forces will depend on the garrisons to be left by the Force Commander but must be separately arranged until these detachments are absorbed into the forces on the mainland.

Any Airborne Force to be landed (Paragraph 6 d of Part III) must carry supplies up to the period of junction with the main Ground Forces, plus a reserve for unexpected contingencies. These supplies must be dropped with the troops at the time of landing.

7. Evacuation.

a. Casualties.

Eventually it may be possible to make use of civil hospitals in Southern FRANCE. Initially it will be necessary to evacuate casualties by sea. Shipping and hospital considerations will determine the extent to which Corsica can be used.

b. P.O.W.

Based on experience in ITALY, numbers of P.O.W. should not be large. Numbers may well depend, however, on the state of morale of German formations, and provision must be made for early establishment of P.O.W. cages and subsequent evacuation by sea.

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APPENDIX 5

10 Dec 43

OPERATION "ANVIL"

The following plans are to be prepared in order of priority shown below and submitted to G-3 (Plans), A.F.H.Q. as early as possible:

Reference Maps: EUROPE 1:500,000 (Air)
Sheets: MARSEILLES, NICE
BERNE, BOLZANO, TORINO, VENEZIA.

A. Plan "WIPER"

Plan for liquidation of all enemy opposition on ILES D'HYERES. All these islands to be dealt with about D-day.

B. Plan "DIPPER"

Plan to prevent all troop movements between area SANARY - incl. CAVALAIRE and 20 miles inland (about D-1).

C. Plan "FLOAT"

Plan to cover area SOUTH COAST OF FRANCE to hamper troop movements within the limit of exploitation, namely 200 miles.

D. Plan "TOPLINK"

Plan to assist in containing the greatest possible number of enemy troops in NORTH ITALY between now and D-day.

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APPENDIX 5-A

DRAFT OUTLINE PLAN "WIPER"

Maps: GSGS 4040B Sheets: 248 SW. 248 SE.

OBJECT

The liquidation of enemy opposition on ILES D'HYERES.

APPRECIATION

The fact that the civilian population has been evacuated from these islands precludes the use of SOE/OSS agents in the pre D-day period. However, there are specific tasks which are outlined below which might be satisfactorily accomplished by detachments of S.A.S. (Note: It is not recommended that OSS/OG's be used as, the Islands having no civil population, their language qualifications are better reserved for use on specific targets on the mainland).

TASKS - in order of priority are as follows:

- (i) The severing of communications between all three islands and the mainland.
- (ii) The elimination of the gun positions at points 182881, 189865, 192858 on the ILE DE PORQUEROLLES, and at points 288858, 290856, 300870 on the ILE DE PORT CROS covering the entrance to the channel. Gun position at point 396917 on ILE DU LEVENT also to be attacked.
- (iii) To assist in cutting the boom between ILE DE PORQUEROLLES and ILE DE PORT CROS.

These attacks to be put in simultaneously with the landing of RANGER battalions.

22 Dec 43.

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APPENDIX 5-B

DRAFT OUTLINE PLAN "DIPPER"

OBJECT

To prevent all troop movements between area SANARY - incl. CAVALAIRE and 20 miles inland (about D - 1).

APPRECIATION

Road and rail communications in this area are few, therefore any movement within that area can be controlled by cutting these communications at as many points as possible. It is not the intention to attempt demolitions on a large scale, but rather to effect as many small acts of sabotage as possible in order to keep these routes closed for a minimum period of 12 hours, bearing in mind the necessity for the subsequent use of these routes by our own troops.

It must be appreciated that road targets will necessarily be more difficult than rail, but the main efforts will be concentrated in the areas around the 20-mile boundary with the intention of precluding the introduction of enemy reinforcements into the area.

The forces necessary to accomplish the tasks are as follows:

- (i) JEDBURGH teams, consisting of 2 officers and one W/T operator, whose work is to take command of existing groups in the periphery of the area to deal with specified targets.
- (ii) O.G's of O.S.S. or detachments of S.A.S.
- (iii) The "maquis" groups, under O.S.S./S.O.E. guidance who will engage in harassing tactics.

The tasks can be divided into four main headings:

- (a) Cutting of all rail communications within the area.
- (b) Attacking road targets.
- (c) Attacking airfields with the object of
 - i.. Hampering the use of enemy fighter aircraft by attacking aircraft on the ground.
 - ii. Hindering the landing of enemy reinforcements by air.
- (d) Complete sabotage of all telephone and telegraph communications within the area.

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TOULON

Particular attention to be paid to the PORT OF TOULON. The intention is to place within the Port "counter-scorching" parties, consisting of 1 French Naval officer and one W/T operator, working direct to this HQ, whose main task will be:

- (i) To disable Signals communications by attacks on telephone exchanges and port control, in order to hamper enemy attempts to immobilize the port.
- (ii) To prevent all demolitions within the dock area.
- (iii) To sabotage tugs and lighters to assist in the prevention of laying blockships.
- (iv) To prevent, by diversion, the destruction of all Power Stations.
- (v) To observe and warn any alteration in the position of buoys and landing marks.
- (vi) To act as pilots to invasion craft on D-day.

NOTE: This Naval force has been specially trained by S.O.E. and are under S.O.E. A.F.H.Q. control. The troops are an exceptionally good type and are particularly suited to the tasks in hand for the following reasons:

- (i) They have a knowledge of the TOULON dock area.
- (ii) They have the added advantage of being better able to recruit saboteurs from French Naval dockyard workers, having regard to the still present feeling of French Naval personnel towards the Allied Forces.

22 Dec 43.

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APPENDIX 5-C

OUTLINE PLAN "FLOAT"

A. OBJECT

To prepare a plan of the action to be taken by O.S.S./S.O.E. organizations to hamper enemy troop movements within the limit of exploitation of "ANVIL" plan, namely, SOUTH coast of FRANCE to a depth of 200 miles.

B. INTRODUCTION

1. During the past three years LONDON has built up various types of resistance organizations in FRANCE supplying W/T communications, organizers and arms.
2. LONDON's primary interest has naturally been in the former Occupied Zone, but considerable organization exists in the SOUTH.
3. The SOUTHERN area has naturally suffered in the supply of arms and material
 - (a) owing to distances from U.K. bases;
 - (b) non-availability of aircraft from N. AFRICA bases during the summer of 1943. (Available aircraft being fully employed on CORSICA and ITALY).
 - (c) The mountainous nature of the terrain makes clandestine delivery practically impossible during certain winter months, although the areas form a natural refuge for many thousands of outlaws who are potential saboteurs and guerillas.

C. FORCES AVAILABLE WITHIN "ANVIL" AREA

1. The forces available within S. FRANCE fall into two main categories:-
 - (a) Immediate action groups which are organized to deal with specific targets and will on D-day have the function of carrying out sabotage. They are to a small extent already equipped and engaged in this work.
 - (b) The large potential represented by sympathetic groups which are not active now but which come into action on D-day provided they are armed. It is difficult to provide details of numbers with any accuracy owing to the claims made by the various interested political movements.
2. Detail of Forces in ANVIL area
 - (a) The Armee Secrete

This is not in fact an army but its effectives are drawn from members of the organized Gaullist resistance movements who are not outlaws.

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Appendix 5-C

THIS MAP IS PREPARED BY REDUCING 1:50,000
G.S.G.S. 4040 B SHEETS: 248 N.W.-S.W.-N.E.-S.E.

TOULON

BIGOT 'ANVIL'

UNCLAS MOST SECRET

APPENDIX 3

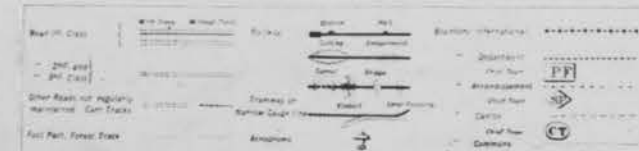
COPY N° 1

AF 3248

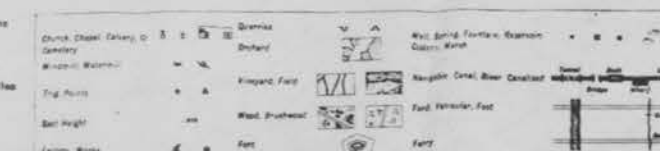


Brhead. 2 Div. Assault — BLACK
Brhead. 3 Div. Assault --- RED
Pre H-Hr. Operations ○ GREEN

THIS MAP IS PREPARED BY REDUCING 1:50,000
G.S.G.S. 4040 B SHEETS: 248 N.W.-S.W.-N.E.-S.E.



SCALE 1:75,000
The Grid on this map is Lambert Zone III. Origin: the intersection of the parallel 49 Grades
North with the longitude of Paris Observatory



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They are in effect members of secret societies who lead normal lives for the most part and meet only in secret to carry out special tasks.

They will become an effective force only on D-day if supplied with arms and directed to specific types of activity.

In the area under consideration they are divided into five "regions", each with its own regional structure.

It is estimated that at the present their numbers amount to some 70,000 of which approximately 2,000 are armed.

(b) The Franc Tireurs and Partisans

Controlled by the Communist party, most of the day-to-day acts of terrorism and sabotage have been carried out by these groups. They do not form part of the "Armee Secrete" but are willing to cooperate on D-day, and have come to 'live and let live' agreement with other organizations.

They are estimated to be well armed and disciplined and with high security; but although very numerous in FRANCE as a whole are largely centered in the industrial North; in the area under consideration they number at least 10,000 men mainly concentrated near LYONS and MARSEILLES.

(c) Armee de l'Armistice

The professional army retained by FRANCE under the terms of the armistice with GERMANY consisted of 100,000 men. Considerable amounts of material, arms and transport were "cached" during 1940-42 until it was disbanded on the occupation of the former Z.N.O. in November 1942. Though the Germans have seized a proportion of their stores, large supplies are estimated still to be available.

Considerable elements of this army remain clandestinely organized and certain categories of troops even remain camouflaged for non-armed duties with consequent retention of discipline.

The organized number still in existence is at least 20,000.

In view of its military origin this group owes allegiance to the C-in-C of the FRENCH forces but because of its association with the VICHY administration its relationship with other organizations has not always been easy.

It is however to be considered as an important factor on D-day owing to its mobility, discipline and high officer content, and steps have been taken to ensure cooperation.

(d) "MAQUIS" Groups

The "maquis" is a general term covering all those members of the different resistance organizations who are living as outlaws. A great number are refugees

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from the "releve" and are drawn from the 1939-43 classes which are legally subject to forced labor service in GERMANY: they probably number 100,000 but are sparsely armed.

Owing to their age the majority have little military experience though some groups have older men and even parts of military formations living with them and acting as instructors.

The groups vary in size but are seldom more than 100 strong, although frequently a large number of such groups is found in isolated farmsteads in one area.

A regional structure, parallel to that of the "Armee Secrete", has recently been formed though by the nature of their existence large numbers are as yet not under any control. The Communist party is particularly interested in the "maquis" as it is part of their policy to recruit and succor all those who are 'on the run'.

These groups are continually being hunted by the GERMANS and where they are armed often become involved in open battle.

They are found everywhere in the high ground but are notably concentrated on both sides of the RHONE VALLEY and in the ALPS bordering the ITALIAN frontier.

(c) LONDON groups.

These groups exist all over the area and are organized on a cellular basis being designed to attack a number of specific objectives.

The organizers are in the majority of cases BRITISH officers fully briefed and sent out from LONDON.

Their objects are very precise and their discipline strict so that, although the numbers concerned are small, they can be relied upon to carry out to the letter any orders given.

Their specific objectives include industrial targets, airfields and a network of targets throughout the railway system.

Material for the execution of their tasks is generally available.

D. FORCES AVAILABLE FOR INFILTRATION

1. Pre D-day:

- (a) Clandestine agents; organizers, W/T operators, instructors, to join existing organizations.
- (b) Allied liaison missions for reconnaissance and information purposes in areas at present little organized.

2. D-day and post D-day

- (a) Small teams of Allied officers with W/T link for contacting, instructing and directing existing groups to specified targets.

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- (b) Operational groups and detachments of S.A.S. for attack on specific targets as a military operation.

E. PLAN

1. To continue the policy of discouraging the population of FRANCE from taking any action until instructed by the Supreme Allied Commander.
2. To build up the strength and control of those groups situated in the most favorable strategical areas:
 - (a) by the infiltration of organizers and W/T links
 - (b) by infiltrating by all possible means further stores of arms, explosives, food, clothing, medical supplies, etc., together with instructors.
3. To use on or after D-day specially trained uniformed Allied troops with, if possible, linguistic qualifications, for carrying out specific strategical tasks as a military operation.
4. The infiltration of teams of Allied officers to organize FRENCH groups to carry out specific strategical tasks.
5. To encourage, by propaganda, those portions of the population which, although sympathetic to the Allied cause cannot be organized and supplied, to act in accordance with the direction of the Supreme Allied Commander.

F. CONCLUSION

It will be seen from the foregoing that there are in ANVIL area considerable forces organized and available on D-day, a large numerical proportion of which can only become effective if properly armed and directed to specific action.

23 December 1943.

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DRAFT OUTLINE PLAN "TOPLINK"

OBJECT

To assist in containing the greatest possible number of enemy troops in NORTHERN ITALY between now and D-day.

PLAN

The plan is divided into three phases:

- (i) To prevent movement of enemy troops and continually harass lines of communication on the North - South routes running from A.F.H.Q. area into that of 15th Army Group.

To be accomplished by O.G's of O.S.S. and detachments of S.A.S.

- (ii) To provide diversions during the period approximately D - 28 to D-day, by organized resistance in the LOMBARDY Plains and particularly in the UDINE area.

To be undertaken by partisan groups under the direction of O.S.S./S.O.E.

- (iii) To sever the lines of communication on the FRANCO-ITALIAN frontier to prevent movement of enemy troops into FRANCE on or around D-day, attacks to continue until D-day + 10.

To be effected by JEDBURGH teams and partisans under the direction of O.S.S./S.O.E. and assisted by the Committee of Liberation.

It is appreciated that the success of operation "ANVIL" will largely depend on the ability to prevent the movement of all enemy troops from NORTHERN ITALY into FRANCE on or about D-Day

THEREFORE, every effort will be made in the intervening period to ensure that all targets are properly prepared before D-day and ready for execution at two days' notice.

These targets to be closely coordinated with those on the FRENCH side of the frontier.

22 Dec 43.

NOTE: A detailed plan will be submitted in due course by Italian Headquarters of S.O.E./O.S.S.

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SECTION III

LIST OF ANNEXES

- ANNEX A - Ports in Southern FRANCE.
- ANNEX B - Tactical Study of the Terrain - Southern FRANCE.
- ANNEX C - Weather Conditions on the South coast of FRANCE.
- ANNEX D1 - Beaches - Southern FRANCE.
- ANNEX D2 - Coast Defenses and Beaches - Southern FRANCE.
- ANNEX E -- Airfields in Southern FRANCE.
- ANNEX F - G.A.F. disposition and scale of effort.
- ANNEX G - Enemy naval forces.
- ANNEX H - Dispositions of formations at 1 April 1944 from which ANVIL force might be chosen.
- ANNEX I - Additional resources required from outside this theater to implement plan.
- ANNEX J - Calculations on which figures for build-up are based.
- ANNEX K - Administrative appreciation.
- ANNEX L - Railways in Southern FRANCE.
- ANNEX M - Map of South of FRANCE.

NOTE: Map at Annex D2 shows all place names referred to in the Appreciation.

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SPECIAL NOTE

1. ANNEX "I", SECTION III (Additional Resources required from outside the MEDITERRANEAN Theater) must not be taken as constituting executive request for the provision of the items detailed, except in the case of the additional assault shipping and craft required for a three divisional assault.

When final decisions are made as a result of detailed planning, definite requests for the provision of requirements will be submitted through normal channels.

2. The Service Troops required to implement Operation ANVIL are NOT detailed at ANNEX "I", but are now the subject of negotiations between AFHQ and WASHINGTON.

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ANNEX "A"

PORTS IN SOUTHERN FRANCE

PORTS on MEDITERRANEAN COAST BETWEEN FRANCO - ITALIAN and FRANCO - SPANISH Frontiers

NOTE: 1. Berths in Column c. below are classified as follows:-

Class 'A' berth will take a ship 600 ft. long and 30 ft. draught.

"	'B'	"	"	"	"	"	450	"	"	"	26	"	"
"	'C'	"	"	"	"	"	450	"	"	"	20	"	"
"	'D'	"	"	"	"	"	350	"	"	"	20	"	"
"	'E'	"	"	"	"	"	250	"	"	"	16	"	"
"	'F'	"	"	"	"	"	200	"	"	"	12	"	"

2. The capacity shown in Column e. below is the average daily figure that could be discharged and cleared over a period, assuming shipping is available to work all alongside berths.

Place <u>a.</u>	Position <u>b.</u>	Number of alongside berths (NOTE 1) <u>c.</u>	Normal clearance facilities <u>d.</u>	Capacity Long tons D.W. per day (NOTE 2) <u>e.</u>	Remarks <u>f.</u>
MENTON	43° 47' N 07° 31' E	4F	Road only	600	The harbor is liable to silting and exposed to easterly winds. There is a small hard at the root of the jetty with depths of 10 ft. at edge. Direct exist on to road.
MONACO	43° 44' N 07° 26' E	4C, 3F, 1F and 3B stern to (25' draught)	Road and rail. (Single line only)	1,500	Entry is difficult in easterly winds. If all stern to berths are occupied harbor would be very congested. Eight mooring buoys 100 yds east of wall. Ships can berth with anchor down and stern secured to the buoys.
VILLEFRANCHE	43° 42' N 07° 20' E	2D on mole. Landing craft at quays.	Road and rail from town station	400	Coasters only but with good anchorage in the bay. Loading facilities at town station very limited.

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Place a.	Position b.	Number of alongside berths (NOTE 2) c.	Normal clearance facilities d.	Capacity Long tons D.W. per day (NOTE 2) e.	Remarks f.
NICE	43° 41' N 07° 17' E	6D, 6E, 2F.	Road and rail from town station	2,500	Draught limit 22'. Length limit 410'. Anchorage at VILLEFRANCHE.
ANTIBES	43° 35' N 07° 08' E	2E, 1F.	Road and rail from town station	500	Small coasters only. Clearance from mole quay not good. Bulk oil storage facilities are available.
CANNES	43° 33' N 07° 01' E	3E, 3F.	Road and rail from town station	600	Small coasters only. The reported new harbor works are not seen on air photographs, and may have been confined to extensive dredging only.
ST. RAPHAEL	43° 25' N 06° 46' E	1D.	Road and rail from town station	300	A small harbor with a difficult entrance, exposed to southerly winds.
ST. MAXIME	43° 18' N 06° 38' E	Landing craft only.	Road only	-	
ST. TROPEZ	43° 16' N 06° 38' E	2F and landing craft	Road only	400	Small coasters only. Mole 300' long.
TOULON	43° 07' N 05° 56' E	11A, 11B, 8C, 10D, 10E, 18F. The above berths include those in the Naval harbor NOT already blocked.	Road and rail.	10,000	A first class port and Naval base. Clearance from some of the berths in the Naval harbor would be difficult. The numerous dry docks have not been included as possible berths, but could be adapted to accommodate 6A, 3B, 1C, 2D, 1E, 2F.
PORT DE LA SEINE	43° 06' N 05° 55' E	1C, 2E, 11F.	Road and rail.	1,000	A satellite port in the Bay of TOULON.
LA CIOTAT	43° 10' N 05° 37' E	2E alongside and 1A at buoy outside harbor. Landing craft.	Road and rail from town station	600	Clearance facilities are not good. Berths are alongside in or across head of Dry Dock. Lighter quays.

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Place <u>a.</u>	Position <u>b.</u>	Number of alongside berths (NOTE 1) <u>c.</u>	Normal clearance facilities <u>d.</u>	Capacity Long tons D.W. per day (NOTE 2) <u>e.</u>	Remarks <u>f.</u>
CASSIS	43° 12' N 05° 32' E	Landing craft only	Road.	-	650' of quays with 3' alongside. 18' in harbor.
MARSEILLE	43° 20' N 05° 20' E	22A, 45B, 15C, 20D, 15E, 2F.	Road and rail.	20,000 with spare berths.	The best port in France.
PORT DE BOUC (incl. Martigues)	43° 24' N 04° 59' E	PORT DE BOUC 6C, 11F, and 1 tanker. Possibly also 2E berthed alongside mole and discharge to lighters on landward side (see remarks) MARTIGUES. 2C.	Road and rail.	3,000	Mole is built on foundation of boulders and is rough faced on inner side. It is not known whether ships can berth alongside. Berths include those in CANAL D'ARLES and CANAL MARITIME. The North quay at MARTIGUES appears to be broken in several places and is not considered suitable for berthing. Easily blockable entrance where depth of 31 ft. is maintained by dredging. A channel dredged to 29 ft. leads to the entrance of CANAL MARITIME which is in turn dredged to 27 ft.
ETANG DE BERRE		2 Tankers, 20' draught.		650 tons per hour.	If dredging has been maintained depths up to 26 1/2 ft. are available.
ST. LOUIS DU RHONE	43° 23' N 04° 29' E	8C. 1 Tanker Berth.	Road and rail.	2,000	Can take coasters up to 20' draught.
SETE	43° 24' N 03° 41' E	20C, 5D, 10E, 22F. 1 Tanker Berth.	Road and rail. Destruction of swing bridges in port area would severely limit clearance capacity.	7-8,000	Ships drawing over 23 ft. cannot enter the port. Swing bridges have to be negotiated before several of the berths can be worked.
AGDE	43° 17' N 03° 27' E	Landing craft only.	Road and rail from town station.	-	A canal port with about 450 yds of quay with 10 ft. water alongside on west bank.

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Place <u>a.</u>	Position <u>b.</u>	Number of alongside berths (NOTE 1) <u>c.</u>	Normal clearance facilities. <u>d.</u>	Capacity Long tons D.W. per day (NOTE 2) <u>e.</u>	Remarks <u>f.</u>
LA NOUVELLE	43° 01' N 03° 04' E	8F and landing craft (incl. 2F in turning basin)	Road and rail.	600	A canal port with 1,800 ft of quayage on south wall and 720 ft of quayage in turning basin. Harbor is liable to silting, and it is unsafe to rely on depths of more than 15 ft. There may be still less water if port has not been maintained.
PORT VENDRES	42° 31' N 03° 07' E	1B, 4C, 1D, 1F.	Road and rail.	1,500	Good anchorage in depths of about 112 ft. about 1/2 mile north of POINTE DU FANAL. With high winds from the N.E. vessels bump badly at Quay de la Presqu'ile and have to anchor in the road or Avant Port.

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ANNEX "B"

Provisional
Tactical Study of the Terrain

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Office of the Assistant Chief of Staff, G-2,
ALLIED FORCE HEADQUARTERS,
19 December 1943.

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Annex "B"

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R E F E R E N C E S

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Provisional Tactical Study of the Terrain

S O U T H E R N F R A N C E

1. Notes on Preparation of Report:

- a. This report has been compiled from the best intelligence available at the present time.
- b. Where logistical conclusions have been drawn, they have been prepared or agreed by Log. Plans, A.F.H.Q.

2. Topography:

The topography of Southern FRANCE, although complex in detail, fits into a simple pattern of six fundamental divisions:

a. The PYRENEES:

A mountain barrier extending east-west the entire length of the border between FRANCE and SPAIN.

b. The AQUITAINE Basin:

A vast triangular lowland lying north of the PYRENEES and southwest of the MASSIF Central, extending westward from an apex at the CARCASSONNE Gap near the MEDITERRANEAN Coast to a broad base along the entire FRENCH coast of the Bay of BISCAY.

c. MASSIF CENTRAL:

A shield-shaped group of plateaux and low mountains bounded on the west by the low northeastern hills of the AQUITAINE Basin, on the south by the CARCASSONNE Gap and the MEDITERRANEAN Lowlands, and on the east by an escarpment forming the west wall of the RHONE-SAONE Valley.

d. RHONE-SAONE Corridor:

A pronounced depression consisting of undulating plains broken by low hills, extending north-south between the almost rectilinear escarpment of the MASSIF Central in the west and the more irregular frontal ranges of the ALPS and JURA Mountains in the east.

e. ALPS:

A broad system of high mountains whose main axis extends north from the MEDITERRANEAN to the SWISS border, then curves sharply northeast, its westernmost frontal ranges forming the eastern boundary of the RHONE-SAONE Corridor and the MEDITERRANEAN Lowlands.

f. MEDITERRANEAN Lowlands:

A flat plain extending along the coast from the Eastern PYRENEES to the ALPS, narrow in the west but rising to gently rolling hills southeast of the CEVENNES Mountains, and including the low marshy RHONE delta.

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Annex "B"

~~UNCLASSIFIED~~a. The PYRENEES:

This compact mountain chain lies like the hull of an overturned boat across the isthmus between the Bay of BISCAY and Golfe du LION, its summits forming the keel, which coincides with the border between FRANCE and SPAIN. The greater part of the range has an average crest elevation of over a mile, increasing in the central portion, known as the High PYRENEES, to 9,000 feet, with several peaks over two miles high. The northern flank of the range slopes steeply down toward the AQUITAINE Basin, where in the center, the mountain spurs are buried beneath the vast alluvial fan of the GASCON Hills. The Eastern PYRENEES are bold in relief, but lower than the High PYRENEES and pinch out eastward to a single ridge that plunges into the MEDITERRANEAN at the rocky CABO DE CREUS.

Many short streams have carved deep gorges across the folded rocks of the PYRENEES, but no river traverses the entire range, and few divides are lower than 5,000 feet, so that transmontane communications are restricted to two routes: TOULOUSE - BARCELONA and PAU ZARAGOZA. The only other important routes skirt the coasts around each end of the range. Valley walls are, in general, very steep, with thin stony soil, while upper slopes are often bare rock, and valley bottoms are sandy with numerous large boulders rolled down by spring torrents. Perennial snow is not so widespread as in the ALPS, but does occur on some of the higher peaks.

b. AQUITAINE Basin:

This broad depression, hemmed in between the PYRENEES and the southwestern margin of the MASSIF Central, consists of four areas of distinctly different topography: the gullied gravel GASCON Hills fanning northwestward from the PYRENEES; the Northern AQUITAINE low limestone plateaux, the gently rolling, sandy, pine-forested LANDES bordering nearly the entire FRENCH BISCAYAN coast; and the GARONNE River Valley with its silty flood-plain and low terrace gravels.

(1) The GASCON Hills are an ancient alluvial fan or delta of immense proportions, composed of gravels and sands washed down into the AQUITAINE Basin by a multitude of streams draining the northern PYRENEAN slopes. The most striking characteristic of this fan, which measures about 240 miles along its northern perimeter, is that all of the valleys radiating across it have steep eastern (west-facing) slopes and gentle western slopes. The former are heavily wooded, while the latter are largely cultivated.

(2) Between the GARONNE-GIRONDE Valley and the MASSIF Central lies a series of low limestone plateaux forming the northern part of the AQUITAINE Basin. Although the plateaux, which average 75 miles in width, are generally low, rising from west to east, the valleys are relatively deep and very steep-walled. Oak forests, pasture and farmland of variable quality occupy most of the surface.

(3) Along the BISCAYAN coast from the GIRONDE Estuary to the PYRENEES, bordered to the northeast by the GARONNE River, and to the southeast of the outer fringe of the GASCON Hills, is an expansive, undulating sandy plain called the LANDES. On the coast is a great sand dune barrier, with many sizable lagoons in the northern part. Pine forests cover large tracts interspersed with pastures.

(4) The GARONNE River rises in the High PYRENEES and flows across the GASCON Hills to a northwest-trending flat-bottomed valley, with low, rolling hills. This natural east-west corridor between the PYRENEES and the MASSIF Central continues

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eastward as the upper AUDE River Valley. Cultivation is intensive, but most farms and settlements are situated on low rises or hillocks to avoid the periodic floods to which the valley bottom is subject. The Canal du MIDI, an important waterway linking the Atlantic and the MEDITERRANEAN, and a main road and railway follow the GARONNE Valley through the CARCASSONNE Gap.

c. MASSIF CENTRAL:

Between the two natural routes leading across FRANCE from the MEDITERRANEAN lies a broad area of difficult country characterized by rolling uplands of crystalline rock in the northern half, numerous volcanic cones and lava flows in the Central AUVERGNE district, and limestone plateaux in the south.

The CEVENNES Mountains and the MONTAGNE NOIRE rising abruptly out of the MEDITERRANEAN Lowlands, form the southeastern run of the highlands, a forbidding forested barrier to penetration into the interior. Directly within this rugged arc lies a series of rolling limestone plateaux, known as CAUSSES, which are deeply dissected by gorges, and marked by bare summits and bouldery slopes, usually grassy, but with occasional woods. There are few streams in this area except major rivers, since a large proportion of incipient rainfall disappears underground into caves and subterranean solution channels. Tillable soil occurs only in patches; elsewhere it is thin and stony.

North of the limestone plateau area is a volcanic region consisting of a crystalline upland surmounted by numerous cones and lava flows. Some of the cones are steep-sided, others very flat; some are so dissected they are hardly recognizable, while others retain even their craters. The highest of these is PUY DE DOME, which attains 4,805 feet. The soils are deep and rich in mineral matter, especially in the vicinity of the basalt cones and flows. The terrain is quite broken, but passage cross-country is possible locally.

Just north and west of the volcanoes is the LIMOUSIN Plateau, a monotonously undulating surface of hard rock with poor soil with a large number of streams radiating outward, feeding the LOIRE and GARONNE River systems. The valleys are open, with gentle slopes in the higher inner part of the plateau, deepening to gorges toward the periphery. The region is mainly pasture and heath, with occasional chestnut and beech woods, especially in the valley bottoms. On the northern border some cultivation of cereals is possible with the aid of imported chalk. Movement should not be difficult across this plateau, but entry into it would ascend the gentle spurs rather than take the narrow valleys.

Between the LIMOUSIN Plateau and the RHONE Valley lies a confused area of plateaux, ridges and peaks, cut at frequent intervals by northeast-flowing streams which join the SAONE or the RHONE. The main drainage, however, is that of the LOIRE and ALLIER Rivers, which head in the southern portion of the area and flow in deep parallel valleys northward to the PARIS Basin. Entry into this province is extremely difficult from the south-east and east because it presents an abrupt wooded escarpment towards the RHONE Valley. Movement within the province would be possible locally on plateau summits, but severely restricted on a broader scale by the intricate drainage system.

d. RHONE-SAONE Corridor:

The SAONE and RHONE Rivers flow a nearly straight course southward in a rift valley of variable width, but flow the entire distance against the foot of the great MASSIF Central escarpment to the west. The valley is a "corridor" only in the sense that it provides a lowland passage between two great

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mountain barriers. Actually, it consists of a series of flat or gently undulating plains separated from each other by low ridges cutting diagonally across the depression from northeast to southwest, forming excellent barriers to cross-country movement. Evidence of this may be found in the location of two main roads and two main railways along the banks of the RHONE River itself, one pair on each side. Forest and grassland predominate on the slopes and hills, with considerable cultivation in the more fertile plains sediments.

e. ALPS:

The ALPS are a vast zone of wild mountains, 100 miles wide, of very great relief, with numerous extremely deep, open flat-bottomed valleys, and containing several of the highest peaks in EUROPE, notably MONT BLANC (15,782 feet).

On the west the ALPS thrust low spurs into the RHONE Valley, and nearly all of the rivers draining the western slope of the mountain system flow westward to the RHONE, with tributaries flowing north and south, parallel to the general grain of the country. Although the mountains are in themselves a military barrier of the first water, they are easily penetrable to their very core by way of the many open glaciated valleys. These silt-laden streams never run dry, but have maximum discharge during snowmelt in the spring. Rapids, waterfalls, and glaciers are common features in the High ALPS on the ITALIAN border.

The mountains extend southwards to the MEDITERRANEAN Coast, forming the famous RIVIERA, with its many rocky headlands, deep harbors, and sheltered coves with long sand beaches. The mountains generally rise directly behind the beaches, but locally small plains occur on which settlements and cultivation are found. Some of the beaches are backed by coastal lagoons, which are probably quite shallow and sandy. The large ports of MARSEILLE, TOULON and NICE lie in this province.

f. MEDITERRANEAN Lowlands:

The French MEDITERRANEAN Coast from the SPANISH frontier to the PROVENÇAL ALPS is a distinct lowland, with extremely flat beaches the entire distance, backed by large lagoons, some of which appear to be navigable for small boats. The eastern part of the province is occupied by the extensive marshy RHONE delta, over which meander the two forks of the Lower RHONE. East of the delta is the "CRAU", a local pebble-paved plain which is utterly flat and very favorable to deployment of vehicles. There are several tiny ports in the delta area and westward. Throughout most of its length the coast rises inland to low, undulating scrub-covered hills which in turn are backed by the PYRENEES in the south, the CEVENNES in the north, and the PROVENÇAL ALPS in the east. Only two corridors lead from this lowland to the interior: the AVDE River through the CARCASSONNE Gap to the GARONNE River; and up the RHONE Valley to the PARIS Basin and the RHINE Valley. Several important canals connect ports in the lowlands with industrial cities in the RHONE Valley and the AQUITAINE Basin.

3. Beaches and Coast:

Detailed beach reports and collation maps will be prepared in accordance with operational requirements; therefore only a broad outline of the characteristics of each coast line is given:

a. MEDITERRANEAN Coast:

The MEDITERRANEAN Coast of FRANCE extends for some 275 nautical miles from the SPANISH frontier in the west to the ITALIAN frontier in the east. It is divided into two distinct sections by the RHONE delta, the characteristics of each being described briefly as follows:

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(1) FRANCO-SPANISH Frontier - MARSEILLES:

From the SPANISH frontier to ARGELES, a distance of approximately 9 miles, the coast is steep and rocky and backed by the mountainous eastern spurs of the PYRENEES. It is irregular and broken by many small river valleys, but scramble landings could be effected at the mouths of these rivers and in many places the cliffs are scalable, with difficulty, by lightly equipped troops. No beaches in this area are more than 300 yards in length, and these in most cases are backed by a seawall and dominated by high ground.

From ARGELES to the mouth of the RHONE, the characteristics of the coastline change, the land dropping away sharply to a low sandy coastline backed by flat low-lying ground and numerous etangs (lakes) connected to the sea by shallow channels, immediately behind the low dunes. In the northern sector of this area, these etangs form an almost continuous chain. This low coastline is broken by two high promontories, CAP LEUCAT and CAP D'AGDE and by numerous rivers. Flat underwater gradients averaging from 1:85 to 1:115 make this area unsuitable for the landing of M/T and AFV's without special equipment, while the etangs and areas of marshland immediately behind the beaches severely restrict and canalise movement inland. The RHONE delta is backed over its entire length by etangs and extensive areas of marshland which would make movement inland very difficult if not totally impossible.

From PORT BOUC, at the east of the delta, to MARSEILLE, the coastline is rocky, much indented and suited only to scramble landings by small scale raiding parties.

The principal port in this sector is SETE which is situated on a narrow spit of land separated from the mainland by etangs. All communications with the mainland cross major water obstacles and are liable to be easily blocked.

(2) MARSEILLE - ITALIAN Frontier:

Between MARSEILLE and TOULON the coastline is rocky and indented by numerous bays with sandy beaches. Most of these beaches are small, backed by high seawalls and dominated by high ground, and rapid movement and deployment inland would be restricted by steep slopes and rugged terrain. The largest of these beaches is the PLAGES DU PRADO lying about 3 miles south of MARSEILLE; here the ground inland is lower, but is highly populated and intensively cultivated, thus restricting widespread deployment of M/T and AFV's. Scramble landings suitable for small scale raiding parties are possible in many places along this stretch of coast.

East of TOULON, along the northern shores of the GOLFE DE GIENS the coast is rocky, but then turns south forming a narrow sandy isthmus joining the PRESQU'ILE GIENS to the mainland. The western shore of this isthmus is nothing but a narrow sand spit backed by the ETANG DES PESQUIERS, and although landing is possible, there are no exits for M/T or AFV's. On the eastern shore the low sandy coast trends north through northeast to east for nearly 11 miles to CAP DE LEOUBE. This coastline is bordered by a long sand and shingle beach backed in the south by the ETANG DES PESQUIERS, at HYERES PLAGE by a low sea wall and further north by a low cultivated plain crossed by numerous tracks.

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A large anti-tank ditch has been constructed behind almost the entire length of this beach, but despite this obstacle the area appears to offer good possibilities for large-scale landing operations. For $1\frac{1}{2}$ miles to the east of PORT POTHAU is a narrow shingle beach backed by the salt pans LES SALINS D'HYERES. This narrow spit is of little value.

For $2\frac{1}{2}$ miles to the east of the salt pans is a narrow and shingle beach with a number of good exits. This is well suited to large-scale operations but the gradient 1:100 is unfavorable. In the last mile immediately northwest of CAP DE LEOUBE are several small shingle beaches between rocky headlands.

From CAP DE LEOUBE to CAP BLANC there are several small beaches between rocky headlands, the largest $\frac{1}{2}$ mile long, has good exits.

From CAP BLANC to LE LAVANDO the coast is rocky except south of the town where there are two beaches in RADE DE BORMES, separated by a rocky point, together $1\frac{1}{2}$ miles long. They are backed by an anti-tank ditch. Once this is bridged these beaches could be used for large-scale landing operations.

Eastwards from this area towards CANNES, the coastline is generally high and rocky, much indented and backed by steeply rising ground and wooded hills. The scattered beaches large enough for landing operations are in many cases backed by high sea walls, making exits inland for M/T and AFV's difficult. They are all dominated by heights, but could however be used for large-scale landings. From CANNES to the ITALIAN frontier the coast is generally high, rocky, much indented and backed by steeply rising ground which becomes mountainous in character east of NICE. The only large beach in the area is that extending for approximately 1,800 yards immediately to the east of CANNES, but it is backed by a seawall and movement inland is restricted by difficult terrain and confined to narrow roads.

The two major ports of MARSEILLE and TOULON are well provided with road and rail communications.

(3) Conclusion:

The only areas in which large-scale landing operations could be carried out appear to be as follows:-

(a) West of SETE:

Landing craft are limited by shallow water and movement inland is canalised and restricted by numerous etangs and marshy areas.

(b) Southeast of MARSEILLE:

Two miles south of the port of MARSEILLE. 3,100 yards of shingle beach backed by a formidable A/Tk wall.

(c) TOULON - LE LAVANDOU Area:

A long sand and shingle beach approximately 12-15 miles east of TOULON extends for about 4 miles forming the western and northern shores of RADE D'HYERES. The most useful portion of this beach is backed by a large anti-tank ditch.

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To the east and south of this long beach there are several small embayed beaches, also two beaches in RADE DE BORMES (south of LE LAVANDOU). If all these were combined a large force of all arms could be landed.

(d) LE LAVANDOU - CANNES Area:

Several beaches, many of which have sea walls, and lack suitable prepared exits, all backed by high country, but with preparation could be made suitable for large-scale landing. The principal beaches are at BAIE DE CAVALAIRE, ANSE DE PAMPELONE and the smaller beaches near ST. MAYIM.

(e) CANNES Area:

There are two beaches in this area one on either side of the town. To the west the GOLFE DE NAPOULE and to the east CANNES beach. Both beaches are backed by seawalls and movement inland is liable to be difficult owing to rugged terrain.

b. ATLANTIC Coast:

(1) This coastline stretches almost without interruption from the GIRONDE estuary southwards, for about 150 miles, to the mouth of the R. ADOUR. Throughout most of its length it is narrow (less than 100 yards in width) and sandy and is backed by a sand dune zone varying in width from $\frac{1}{2}$ to 2 miles. Behind the sand dunes there is a series of marshes and shallow lakes drained by a system of poorly developed streams and artificial channels, in the north the Plain of GIRONDE has been reclaimed.

(2) From the mouth of the R. ADOUR to the SPANISH Frontier the characteristics of the coastline change and there are a number of several short beaches interrupted by rocky points and backed by steeply rising ground.

Excellent road and rail communications follow the coast closely.

(3) Conclusion:

The whole stretch of coastline, with the exception of the rocky portions in the south, appears suitable for the landing of troops, but movement inland would be canalized and restricted by the lagoons and marshy areas.

4. Tides and Currents:

a. MEDITERRANEAN Coast:

The rise and fall of tide is so slight and irregular as to be of no practical importance. The sea level along the south coast of FRANCE generally rises with southeast winds and falls with northwest winds.

Currents are generally weak and are frequently overridden by local surface drifts caused by the winds. They are not sufficiently strong to affect approach to the coast or the operation of landing craft.

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b. ATLANTIC Coast:

The rise and fall of tide along this coast is considerable, increasing from south to north, average spring tides rising approximately 14 feet. Moderate surf is common along the whole of this coastline and is heavy with strong northwesterly winds.

Currents flow northward parallel to the shore with very low velocities. At the mouths of the ARCAÇON Bay and the R. ADOUR, tidal current velocities attain $4\frac{1}{2}$ and $7\frac{1}{2}$ miles per hour respectively.

5. Communications:

a. Roads:

(1) General Description:

The main roads in Southern FRANCE are usually constructed with bitumen as a binding medium. On some of the main routes there will be found "cassis" or shallow troughs running across the metalled surface. Failure to reduce speed sufficiently often results in broken vehicle springs and may cause serious accidents.

The more important strategic routes such as TOULOUSE - LIMOGES, PERPIGNAN - MONPELIER, AVIGNON - LYON and NICE - GRENOBLE have probably been maintained to a standard approximating normal peacetime conditions. Non-strategic routes and secondary roads have undoubtedly deteriorated below peace-time state of repair.

Bridges, except along the RHONE River, are likely to be old and narrow, many of them being one-way. There are many suspension bridges along the RHONE River which will carry only relatively light traffic.

There are vehicle ferries at CRUAS - LA COUCOURDE and AMPUIS on the RHONE River.

Despite the hilly nature of a greater portion of this section, gradients are usually less than 1:8 (12.5%), but there are many winding roads, sharp turns and hairpin bends on the main routes, except of course, in the TOULOUSE - CARCASSONNE gap, on the coastal plains and in the RHONE Valley. Generally the sharp turns in the mountainous districts are not banked and great caution must be exercised in driving. Along the "Corniche" roads between CANNES and MENTON, the curves are well banked and high speeds may be maintained.

Except for certain areas in the TOULOUSE - CARCASSONNE gap, along the coastal plains and in the RHONE Valley, vehicular deployment off the roads will be very difficult. Even in these good areas there are obstacles near the road in most sections. There are defiles in most sections and observation points are plentiful.

In summer there is a great deal of dust on all the southern roads. In the more hilly regions rock slides occur throughout the year creating a menace to the passage of large amounts of traffic.

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Rivers have a minimum flow during the summer months and many secondary streams dry up.

Snow blocked roads occur in the ALPS, in the PYRENEES and in the Central Highlands during the winter. In the ALPS such blocking rarely occurs below an elevation of 3,300 feet except in the valleys where drifting may be excessive. Although the GENEVRE Pass is at an altitude of 6,100 feet it is kept free except after severe snowstorms.

The main routes along the PYRENEES are free from blocking by snow. Drifting in the valleys and the passes into SPAIN block the higher routes but the route from PERPIGNAN to BIARRITZ via FOIX and TARBES is never blocked.

In the Central Highlands, many of the main routes are intermittently blocked by snow. Relatively few are blocked for more than two days.

(2) French Road Classification:

(a) Route Nationale:

Average width 26 feet, with an asphalt or tarmacadam surface, usually in good state of repair.

(b) Chemin de Grande Communication:

Often 18 - 20 feet wide, with a metalled surface, sometimes with tar or asphalt used as binding medium. This type of road has been known to be in a bad state of repair and sometimes has excessive camber.

(c) Chemin Vicinal Ordinaire:

Usually 16 to 18 feet wide with crushed rock surface. These roads are maintained by the local communes and are tar-sprayed annually in normal times. Most of them, however, are in poor condition.

(d) Route d'Interet Commun:

Usually 10 to 15 feet wide. Surface may be in very poor condition and not suitable for heavy traffic.

(3) Principal Routes within the area south of the line BORDEAUX - VICHY - LYON are as follows:-

(a) Along the PYRENEAN foothills the main routes are:-

(1) PERPIGNAN - FOIX - TARBES - PAU - BIARRITZ.

(2) NARBONNE - CARCASSONE - TOULOUSE - AUCH - AIRE - MONT DE MARSAN - DAX - BIARRITZ.

(b) On the MEDITERRANEAN Coastal plain the main routes are:-

(1) PERPIGNAN - NARBONNE - BEZIERS - MONTPEILLER - SALON - AIX EN PROVENCE - CANNES - NICE.

(2) AIX EN PROVENCE - MARSEILLE - TOULON - CANNES

(3) NIMES - CAVAILLON.

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(c) In the Central Highlands the main routes are:-

- (1) TOULOUSE - ST. FLOUR - MOULINS.
- (2) MONTPELLIER - LODEVE - ST. FLOUR.
- (3) NIMES - MENDE - LE PUY - MOULINS.
- (4) TOULOUSE - CAHORS - BRIVE - LIMOGES.
- (5) CARCASSONE - ALBI - VILLEFRANCHE - TULLE.
- (6) CAHORS - RODEZ - MENDE - ST. ETIENNE - LYON.
- (7) TULLE - AURILLAC - LE PUY - LYON.
- (8) BRIVE - TULLE - CLERMONT FERRAND - LYON.
- (9) LIMOGES - CLERMONT FERRAND.

(d) In Southwestern FRANCE the main routes are:

- (1) BIARRITZ - BORDEAUX - SAINTES - LA ROCHELLE.
- (2) BORDEAUX - ANGOULEME - LIMOGES.
- (3) BORDEAUX - PERIGUEUX - BRIVE.
- (4) BORDEAUX - LANGON - CONDOM - AUCH.
- (5) LANGON - VILLENEUVE SUR LOT - CAHORS.

(e) Along the RHONE River valley there are two roads, one along each side of the river, which are:-

- (1) REMOULINS - LYON.
- (2) AVIGNON - VALLENCE - LYON.

(f) In the lower ALPS the main routes are:-

- (1) CANNES - DIGNE - CHATEAU ARNOUX - SISTERON - GAP - GRENOBLE - LYON.
- (2) SISTERON - ASPRES - GRENOBLE.
- (3) AIX EN PROVENCE - CHATEAU ARNOUX.
- (4) NICE - BARREME.

(g) Entry routes from ITALY to FRANCE are:-

- (1) GENOA - NICE.
- (2) TURIN - CUNEO - TENDA Pass - NICE.
- (3) CUNEO - MADDALENA Pass - GRENOBLE.
- (4) TURIN - MONT GENEVRE Pass - BRAINCON - CAP or GRENOBLE.
- (5) TURIN - SUSA - MT. CENIS Pass - MODANE - GRENOBLE.
- (6) AOSTA - Little ST. BERNARD Pass - GRENOBLE.

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Except for the GENOA - NICE route, blocking by snow occurs for several months of the year, from October to May.

b. Railways:

(1) General Description:

In 1938 the Societe Nationale des Chemins de Fer Francais (S.N.C.F.) was instituted and French railways were divided into five regions. The area south of a line from BORDEAUX - VICHY - LYON includes all of the Region SUD-EST as well as Region SUD-OUEST.

The Region SUD-EST consists of approximately 10,000 toute-kms., of which about one half is of double track and one half of single track. The only industrial districts in this region are LYON - ST ETIENNE and MARSEILLE and most of the served district is thinly populated. In peace-time much of the traffic was seasonal.

The most important railway centres are LYON and DIJON in the northern part and MARSEILLE, MIRAMAS, AVIGNON, NIMES and TOULOUSE in the southern part of the region.

The normal principal flow of traffic from the MEDITERRANEAN is from MARSEILLE along the east bank of the RHONE River through MIRAMAS, AVIGNON, LYON and DIJON to PARIS, by a double-track line. There is also a double-track line on the west bank of the RHONE River.

Other principal double-track lines in the Region SUD-EST are:-

- (a) MARSEILLE - VENTIMIGLIA in ITALY.
- (b) TARASCON - NIMES.
- (c) NIMES - SETE - NARBONNE.
- (d) VALENCE - MOIRANS - GRENOBLE - CHAMBERY.
- (e) LYON - VICHY - MOULINS.
- (f) LYON - PARAY le MONLAL - MOULINS - NEVERS - MONTARGIS.
- (g) MODANE - CHAMBERY - AMBERIEU - BOURG - DIJON.
- (h) VEYNES - BRIANCON (75% double).
- (i) BRIOUDE - VICHY.

The principal single-track roads of the Region SUD-EST are:-

- (a) MARSEILLE - VEYNES - GRENOBLE.
- (b) ALES - BRIOUDE.

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Detailed information pertaining to the Region SUD-OUEST is not presently available. In this region the principal double-track roads are:

- (a) NARBONNE - TOULOUSE - MONTAUBAN - BRIVE - LIMOGES - CHATEAUROUX - ORLEANS.
- (b) TOULOUSE - TARBES - PAU - DAX - BAYONNE.
- (c) MONTAUBAN - BORDEAUX - LA ROCHELLE - NANTES.
- (d) DAX - BORDEAUX - ANGOULEME - RUFFEC.
- (e) BORDEAUX - LIMOGES.

The principal single track roads are:

- (a) PERIGUEUX - BRIVE - CLERMONT FERRAND.
- (b) LE PUY - NEUSSARGUES - AURILLAC - SOUILLAC - BERGERAC - LIBOURNE.
- (c) BEZIER - ST. FLOUR - NEUSSARGUES.

There are a few railways in this region having a gauge of 1 metre. Some of these are in the vicinity of NICE and TOULON.

The principal electrified lines in Southern FRANCE are:-

- (a) SETE - NARBONNE - TOULOUSE - MONTAUBAN.
- (b) ST. GERVAIS - CHAMONIX - CHATELLARD.
- (c) CULOZ - MODANE.
- (d) BRIVE - LIMOGES, probably extended to MONTAUBAN.
- (e) BEZIER - ST. FLOUR.
- (f) TOULOUSE - TARBES - BAYONNE.

Both overhead and third-rail current collection is used. A.C. and D.C. current is used at voltages from 600 to 3,700.

(2) Traffic.

As an indication of capacity the following information for Region SUD-EST is tabulated for 1936:-

Passenger Traffic	69,862,422	train-kms.	run
Mail	"	11,102,695	" " "
Freight	"	33,703,160	" " "
Service	"	1,594,155	" " "
TOTAL:		116,262,432	" " "

Passenger Traffic, 1st Class	693,300	passengers
" " 2nd	"	4,798,752
" " 3rd	"	77,233,569
TOTAL		82,725,621

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Fast and slow freight traffic	32,070,189	metric tons
Service traffic	6,023,874	" "
TOTAL	38,094,063	" "

Certain double-track lines are laid out to accommodate a theoretical maximum of up to 144 trains per day each way. It is known that 96 trains per day have actually been worked over various sections for limited periods. On the single-tracks the capacity has been estimated as 12 to 24 trains per day each way. The standard maximum load for French military trains is 53 cars or 750 metric tons gross. The average running speed for military trains may be assumed to be 18 to 20 miles per hours on main lines and about 12 miles per hour on branch lines. Most of the passing loops and sidings will accommodate trains 547 yards in length.

(3) Vulnerable Points:

(a) Destruction of lines and installations at LYON, AVIGNON, MIRAMAS or MARSEILLE would seriously impede north-south traffic, and in the case of LYON or AVIGNON (with PONT D'AVIGNON) could bring traffic in the RHONE Valley to a standstill.

(b) Destruction of bridges across the RHONE, particularly at ARLES, TARASCON, AVIGNON and LYON would seriously impede traffic; the destruction at the first three places named would stop east-west traffic near the MEDITERRANEAN coast.

(c) The south coast line is vulnerable to sea attack particularly near the SPANISH frontier, at SETE, NIMES and MONTPELIER, between MARSEILLE and TOULON and east of ST. RAPHAEL.

(d) PERCEE DU MALPAS (6312, Sheet 244 NW; 6412, Sheet 244 NE), a tunnel 1,640 feet long under the Canal du MIDI, which itself passes through a tunnel at the same point.

(e) DIJON is a railway centre, at which destruction would cause traffic to take alternate longer routes.

(f) Power stations for the AULOZ - MONDANE and ST. GERVAIS - CHATELLARD lines are vulnerable points of great importance. Damage to the power stations in the PYRENEES and Central Highlands would not hamper traffic to such a great extent on account of alternative sources of supply.

c. Inland Waterways:

(1) General Description:

Except for the RHONE and SAONE Rivers, the waterways in Southern FRANCE are relatively less in economic importance than those of Northern FRANCE and generally are not so large nor so well equipped as in the north.

Many of the maritime rivers are navigable only on high tides and are dry or nearly so at low tide.

The legal depth on many of the canals is 2 metres (6.56 feet) and the permissible draft is 20 cm. (7.84 inches) to 40 cm. (15.75 inches) less than the depth.

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The maximum length of boats must be such that they give 30 cm. (11.81 inches) clearance at the lock gates and the beam or width must give a clearance of 10 cm. (3.94 inches) in the case of boats and 40 cm. (15.75 inches) for rafts.

There are three general classes of boats, but larger boats up 1,200 tons capacity are used on the larger rivers like the RHONE.

The classifications of the smaller boats are as follows:

(a) 38.50 m. (126.28 feet) long, 5 m. (16.4 feet) beam, 280 metric tons capacity.

(b) 30 m. (98.4 feet) long, 5 m. (16.4 feet) beam, 190 metric tons capacity.

(c) 28 m. (91.84 feet) long, 2.5 m. (8.2 feet) beam, 75 to 100 metric tons capacity.

In heavier traffic regions self-propelled boats are frequently used and also mechanical towing has replaced animal towing to a great extent.

The principal waterways of Southern FRANCE are:-

(a) RHONE River and tributaries.

(b) Canal du MIDI.

(c) SETE - RHONE Canal.

(d) MARSEILLE - RHONE Canal.

(e) Canal Lateral a la GARONNE.

(f) GARONNE River.

(2) Detailed Description:

(a) RHONE River and Tributaries:

The RHONE, while it forms a very important part of the transportation system, is difficult to navigate on account of the strong current and shifting bars. Local pilots are required at many places along the route.

This waterway affords a connection between the MEDITERRANEAN and Northern FRANCE, thus linking the important cities of MARSEILLE, SETE and LYON with the remainder of FRANCE. The distance from LYON to Port ST. LOUIS is 206 3/4 miles.

The RHONE is subject to rapid changes in water volume at almost any time of the year, the floods on the main course rising to 21 feet.

The width of the stream is from 600 feet minimum to 3 miles in the delta during extraordinary floods. Due to the shifting river bed the width is not a true indication of navigability. The depth varies from about 4 feet to over 6 ft. 7 inches, depending on the flow conditions.

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There are no locks on the waterway. The differences in level between LYON and the sea is 520 feet. The slope varies up 14 feet 6 inches per 1,000 yards for a short stretch near the ARDECHE River.

In peacetime there were 34 fixed bridges between ARLES and LYON. The minimum clearance is 17 feet 4 inches. Most bridges are metal suspension spans. PONT ST. ESPRIT and VALENCE are masonry arch bridges.

The most common type of craft are the iron "chalands" or barges which are 213 feet 6 1/2 inches long, 25 feet 11 1/2 inches wide, carrying 540 metric tons with draft of 5 feet 3 inches and 625 metric tons with a draft of 5 feet 11 inches.

Special types of motor driven craft have been developed for RHONE navigation. In 1935 there were 19 of these special type craft in operation and since then no doubt additional ones have been built. There are also some special motor-driven wine carrying craft in use which are similar. There are 25 places where it is impossible for craft to pass.

The towing craft used on the RHONE are also specialized, due to the need for great horse-power in running upstream against the strong currents and maneuvering the convoys. The paddle steamers used develop 1,000 h.p. and the turbine-driven tugs develop 1,500 h.p. Sea-going barges of 500 tons and sailing craft of 60 tons are used in the maritime section.

At the various ports and quays the principal facilities are:-

Port ST. LOUIS has a quay 1,840 feet long served by railways. At BARCARIN there is a steam crane and two Temberley transporters, each with a capacity of 2 tons.

ARLES has quays with length of 1,440 feet, the quay on the right bank has a length of 840 feet and is served with a railway. At the port there is a 10-ton crane with arms. There are 7 other cranes of various types with capacities of 1 to 3 tons.

BEAUCAIRE has a concrete landing-stage about 200 yards long with a 2-ton crane.

AVIGNON has a quay wall about 1,650 feet long, equipped with a 5-ton revolving crane.

OSERAIE has a mobile 3-ton electric crane.

LA FARGE has masonry quays about 1,140 feet long, possibly served by a railway.

VALENCE has a stone quay about 900 feet long with two mobile cranes and a warehouse served by a road leading into town.

VIENNE port is served with a tramway with a 3-ton crane mounted on a trolley.

CHASSE has a fixed 3-ton electric crane.

GIVORS has quays along the river and a basin 5 feet 3 inches deep off the waterway. There is a 5-ton crane on the river bank.

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At LYON, on account of the advantages of the SAONE River over the RHONE for navigation, the port facilities have been developed above the MILATIER lock on the SAONE River.

(b) Canal du MIDI:

This waterway crosses the CARCASSONNE Gap, linking SETE on the MEDITERRANEAN coast with BORDEAUX on the ATLANTIC Coast. It passes through or near the important centers of BEZIERS, MARBONNE, CARCASSONNE and TOULOUSE, where it joins the Canal Lateral a la GARONNE leading on to BORDEAUX. The length of the canal from SETE to TOULOUSE is 161 miles. The canal is rarely less than wide enough for barges to pass. The mean depth of the main canal is about 6 feet 3 inches. On the LA NOUVELLE branch the depth is about 4 feet.

There are 65 locks along the main canal and 6 locks on the LA NOUVELLE branch. Minimum lock dimensions are 18 feet wide by 98 feet 5 inches long on the main canal and 18 feet wide by 88 feet 7 inches to 94 feet 4 inches on the LA NOUVELLE branch.

On the main canal there are 124 fixed bridges and 27 on branches. The minimum vertical clearance is 10 feet 6 inches.

At LE MALPAS the waterway passes through a tunnel 538 feet long in which the clearance is 26 feet 3 inches. Under the canal tunnel there is a railway tunnel about 500 yards long.

There are 4 aqueducts by which the canal crosses various rivers.

In 1939 there were 282 boats registered for use on this canal. In 1934 there were 198 motor vessels, ranging in power from 15 to 90 h.p. Also there were 27 tanker craft in 1934.

There are four ports at TOULOUSE having a total of approximately 2,500 feet of quays and 18,000 square feet of storage space. At ST. SAUVEUR and ST. ETIENNE basins there is a 1 1/2 ton electric crane and a scotch-type derrick, total unloading capacity of which is about 150 metric tons per day.

All TOULOUSE ports are served by railway.

There are 3 ports at BEZIERS having about 210 feet of masonry quays and 600 feet of earth-faced quays, and 16,740 square yards of storage space, served by railway.

At NARBONNE there are about 30,000 feet of quays and 9,690 square yards of storage space.

The port of CARCASSONNE has 400 feet of quays and about 1,450 square yards of storage space.

At AGDE the canal port has a quay about 240 feet long and there is about 1,148 square yards of storage space.

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(c) SETE - RHONE Canal:

This canal runs from ETANG de THAU near LA HEYRADE to BEAUCAIRE on the RHONE, a distance of 60 3/4 miles, thus linking the RHONE River with the Canal du MIDI. Access to the MEDITERRANEAN Sea is by the Canal MARITIME at SETE. The main canal and its branches in 1936 carried a total traffic of 255,000 metric tons.

The canal has a width of 32 feet 10 inches at a datum level of 7 feet 3 1/2 inches.

Curves are widened and at intervals of about 1 mile there are canal sidings about 15 feet wide by 360 feet long.

The standard depth along the waterway is 6 feet 7 inches, but the level may vary from 7 inches below to 1 foot 4 inches above the datum level.

There are only three locks on the main canal, the maximum dimensions being: working length 262 feet 3 inches, and 39 feet 5 inches in width.

There are 24 bridges, including two swing bridges across the canal. The minimum clearance is 13 feet 2 inches. There are also four foot-bridges. The usual width of the navigable passage is 45 feet 11 inches, though there are exceptions varying from 27 feet 9 inches to 39 feet 4 inches.

The three principal craft types are:

With superstructure	-	120 metric tons.
Without	"	- 120 to 210 metric tons.
RHONE craft	-	350 to 500 " "

The maximum permissible dimensions are: 246 feet long, 27 feet 5 inches wide and 5 feet 11 inches draft.

There are also some self-propelled barges and a few motor-driven tankers used.

The ports are not equipped with mechanical unloading equipment. BEAUMAIRE, ALGULS - MORTES and BELLEGARDE are ports served by railway. Other ports are FRONTIGNAN and ST. GILLES.

(d) MARSEILLE - RHONE Canal:

This waterway is divided into two sections, one from MARSEILLE to PORT DE BOUC and the other from PORT DE BOUC to ARLES. In 1936 the PORT DE BOUC - ARLES section carried 50,000 metric tons. The total length is 47 3/4 miles.

The normal depth of the PORT DE BOUC - ARLES section is 6 feet 1 inch and the width 47 feet 3 inches, both of which are presumably being increased. In the BOUC cutting which is 1 1/2 miles long, the depth is 8 feet 3 inches and the width 80 feet 5 inches. The remainder of the route has a depth of 13 feet 2 inches or greater and a minimum width of 59 feet.

Between MARSEILLE and PORT DE BOUC there are no locks.

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There are 3 locks between PORT DE BOUC and ARLES which have a minimum working length of 108 feet 4 inches and a width of 25 feet 7 1/2 inches.

The ROVE tunnel near MARSEILLE is 4 1/2 miles long with a basin width of 59 feet and a clearance of 37 feet 3 1/2 inches above the water-level.

On the ETANG de CARONTE the waterway is crossed by a multiple span metal railway viaduct which has a navigable passage through it of 131 feet 2 inches wide and 75 feet clearance.

At MARTIGUES there is an electrically operated swing-bridge with a navigable passage of 131 feet 2 inches. On the PORT DE BOUC - ARLES section there are 5 fixed and 8 mobile types, with a minimum clearance of 19 feet 8 inches.

On the PORT DE BOUC - ARLES section the draft is restricted to 3 feet 11 1/2 inches at the lowest water level. The RHONE "chalands" can navigate on the remainder of the waterway. Coasting vessels can use the ETANG de CARONTE between PORT DE BOUC and MARTIGUES, passing thence into ETANG de BERRE.

The principal ports of this waterway are MARTIGUES ETANG DE CARONTE, and PORT DE BOUC, in addition to MARSEILLE and ARLES at the TERMINI.

Cargo can be transferred direct from ocean to canal shipping at PORT DE BOUC, MARTIGUES and MARSEILLE.

At PORT DE BOUC, which is well sheltered, water depth at low tide is about 20 feet. There is a basin about 1,968 feet long and 656 feet wide with a quay 410 feet long.

The AUBRAN basin in the AUBRAN cove is 820 feet long and 328 feet wide.

The ETANG de CARONTE is 3 1/2 miles long and from 650 feet to 3,000 feet wide, with an anchorage of 500 acres.

In 1933 wharves were under construction along the north shore and a channel 393 feet wide and 26.5 feet deep was being dredged. Ports in this area are served by railway.

(e) Canal Lateral de la GARONNE:

This canal from TOULOUSE to CASTETS-en-DORTHE is about 120 miles long. There are 53 locks on the main canal and 13 on the branches. Dimensions are: 100 feet long by 20 feet wide by 6.56 feet deep.

There are 173 fixed bridges; of these 83 are suspension bridges and two are of reinforced concrete. There are also five swing bridges. The suspension bridges are being replaced by reinforced concrete bridges. The minimum clearance is 11.81 feet. The width of the canal is sufficient for passing of 2 boats. The maximum boat sizes permitted are 98 feet by 17 feet and maximum draft 5.25 feet.

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The principal ports are AGEN, MONTAUBEN and MOISSAC and unloading equipment should handle as much as 150 tons per day.

At AGEN the port is 2,316 feet long and has a quay 1,332 feet long. The port area is 129,670 square feet.

MONTAUBEN has 131 feet of quay walls, 525 feet of embankment and a 1 1/2 ton electric travelling crane

MOISSAC has 1,213 feet of quay wall and a 1 1/2 ton travelling crane.

The SETE - BORDEAUX railway line runs parallel to the canal for most of its length.

(f) GARONNE River and Tributaries:

(1) General:

The ST. MARTORY Canal - GARONNE River - GIRONDE River waterway is 289.56 miles long and is divided into 5 sections described as follows:

Section 1: ST. MARTORY to CRESPIS, 70.84 miles. The first 2.49 miles is classified as floatable but the remainder is navigable. In the floatable section at low water the depth is only 0.98 feet. In the navigable section low water is 0.98 feet and mean water is 1.64 feet deep.

Section 2: CRESPIS to PORT DE BONNEAU, 46.60 miles. Due to adjacent Canal Lateral a la GARONNE there is very little traffic. The low water is 0.82 feet and mean water is 1.64 feet deep.

Section 3: PORT DE BONNEAU to BOURDELLES, 65.24 miles. There is little navigation on this section, mainly transportation of sand and gravel from river bed.

The low water is 0.98 feet and mean water 3.28 feet deep.

Section 4: BOURDELLES to BEC D'AMBES, 61.52 miles. This section carries mainly freighters and is maritime below BORDEAUX. Low water is 3.28 feet and mean water is 9.84 feet deep. At CASTETS there is a tidal range of 11.18 feet and of 14.76 feet near BORDEAUX.

Section 5: BEC D'AMBES to the ocean, 45.36 miles. This section is wholly maritime. At average low tide the depth is 13.45 and at average high tide the depth is 31.66 feet.

There is one lock at TOULOUSE which is 100.56 feet long and 19.69 feet wide.

(2) Bridges and Dams:

In section 1 there are 20 bridges with a minimum clearance of 19.69 feet above high navigable water. Three bridges on the MIDI RR and POUDERIE NATIONALE at TOULOUSE have a minimum clearance of 13.12 feet above high navigable water.

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Section 2 has 9 bridges of 19.69 feet minimum clearance above high navigable water.

Section 3 has 9 suspension and 6 masonry bridges with a minimum clearance of 21.32 feet above high navigable water.

Section 4 has 4 bridges with a minimum clearance of 15.75 feet above high navigable water.

There are two dams on this waterway. The GARONNE unites with the Canal Lateral a la GARONNE above the BAZACLE Dam at TOULOUSE.

Above AGEN there is a movable dam, built to provide continuous water supply to Canal Lateral a la GARONNE. There is also a lock at AGEN.

(3) Boats:

In section 1 boats are 10-ton (minimum) freighters, some self-propelled, some man or horse towed.

Section 2 has no navigation.

In section 3, self-propelled or towed barges from 16 to 180 tons are used. Towed barges use the current going downstream.

In section 4 below BORDEAUX maritime regulations prevail. There are 800 h.p. steam tugs with drafts from 2.62 feet to 5.91 feet, 20 to 80 ton sailing barges, 100-ton flat bottomed yawls, sloops with keels, 90 to 180-ton self-propelled barges and canal boats with draft from 3.94 feet to 5.58 feet at full load.

In section 5 navigation is entirely maritime.

6. Ports:

MARSEILLE with an estimated daily capacity of at least 20,000 tons is the best port in FRANCE; there are also two other first-class ports on the MEDITERRANEAN Coast with estimated capacities as shown below:-

	<u>Estimated Capacity</u>
TOULON	10,000 tons/day
SETE	7-8,000 " "

In addition there are the following smaller ports:

	<u>Estimated Capacity</u>
PORT DE BOUC	3,000 tons/day
NICE	2,500 " "
ST. LOUIS DU RHONE	2,000 " "
MONACO	1,500 " "
PORT VENDRES	1,500 " "

There are 12 small ports in the area, many of which can accomodate coasters.

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A summary of all the ports on the MEDITERRANEAN coast is given at Appendix "E". Detailed descriptions of the port and terminal facilities are contained in CB.4096 J, Vol. 5, I.S.I.S. Report on FRANCE, Southern FRANCE and Strategic Engineering Study No. 84, Port and Terminal Facilities, MEDITERRANEAN FRANCE.

7. Population and Accommodation:

In 1936 there were 14,095,570 people in the forty departments of Southern FRANCE. They constituted about one-third of the total French population of 41,907,056. There are about 350,000 refugees in this area, of whom approximately 25,000 are foreigners. Southern FRANCE contains the second, third, fourth and fifth cities of FRANCE. Respectively they are: MARSEILLE, LYON, BORDEAUX and NICE.

There are many foreigners in the far south, mainly ITALIANS and SPANIARDS, the census for 1931 being 1,022,864.

The twelve most important towns, all of which have a population of more than 90,000, are well distributed over Southern FRANCE, except for the interior of the Massif Central, where there are no large cities. The chief industries, notably the heavy industries, are concentrated in these twelve cities, which are, in the order of size, MARSEILLE, LYON, BORDEAUX, NICE, TOULOUSE, ST. ETIENNE, TOULON, CLERMONT-FERRAND, GRENOBLE, LIMOGES, NIMES, MONTPELIER.

Data on the numbers and populations of towns within the area is as follows:-

120 towns of 5,000 inhabitants and above.					
44	"	"	10,000	"	"
17	"	"	15,000	"	"
21	"	"	20,000	"	"
17	"	"	30,000	"	"
16	"	"	50,000	"	"

Estimated figures for accommodation vary between one-half and two-thirds of the population of the town. Details of town populations in 1936, and principal occupations are given at Appendix "F".

a. MARSEILLE:

This is the largest port of FRANCE, and is situated on coastal railroad and highway between NICE and AVIGNON, as well as on a railroad running inland to GRENOBLE; it has canal connection with the RHONE; there is an important air terminus nearby.

The chief industries are: soap, vegetable oil, chemicals, glycerine, cement, alumina, ship repair and marine engineering works, sugar refining, flour milling, metal refining.

Accommodation: There are 4,780 rooms in first-class hotels, additional rooms available in second-class establishments. In private dwellings, there are about 83,900 rooms available, excluding 50 large country houses within 4 miles of the city. Public buildings with accommodation possibilities are: University, schools, barracks, stadium, clubs.

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Dock labor in 1929 employed almost 6,000 men, road transport 6,200 men, and rail transport employed 13,170 men.

The following firms supplied dock labor in 1929, and may still exist:

Soc. de Travaux et Industries Maritimes,
5, Place de la Joliette.
Soc. Marseillaise d'Acconage et d'Arrimage,
60 Rue de la Republique.
Entreprise Maritime et Commerciale,
78, Rue de la Republique.
Orus et Guillieme,
8, Rue Paradis.
Soc. Commerciale Savon Freres,
25, Rue de la Republique.
Goutier Freres
30-32, Rue de la Paix.
Bontiere et Cie.,
The Bourse Building, 2, Rue de Bausset.

b. LYON:

This is the centre of the principal war production area in Southern FRANCE and the focus of important water, rail and highway routes from all the larger towns of FRANCE. It has extensive barracks, being a pre-war army corps headquarters, two broadcasting stations, and a powerful short-wave station.

The chief industries are: silk and rayon, automotive, chemicals, lesser industries are: armaments, ball bearings, chemical equipment, electrical and radio equipment, iron and steel, rubber.

Accommodation: there are 3,000 rooms in good hotels; probably a much larger number of habitable hotel and "pension" rooms can be used. In private dwellings there are about 59,800 rooms available. Public buildings such as, university, schools, barracks, hospices, hospitals, offer possible accommodation.

c. BORDEAUX:

This is the important port, situated at the head of navigation on the GARRONE, 60 miles from the sea, and is the focus of 6 national highways and five railway lines; connected with the MEDITERRANEAN by the GARONNE Lateral Canal and the Canal du MIDI.

The chief industries are: ship-building and repairing, aircraft and engines, metal and metallurgical products, sulphuric acid, superphosphates and other chemicals, glass, cement, petroleum products, sugar and chocolate, preserved foods, wine,

Accommodation: there are 1,136 rooms in good hotels; many more in secondary establishments. In private dwellings there are about 73,000 rooms available. Public buildings such as, University, eight schools, several barracks offer possible accommodation.

d. NICE:

This is the easternmost large FRENCH MEDITERRANEAN port, and the only one between TOULON and ITALY (15 miles from border), and is the junction of main coastal highway and railroad between TOULON and GENOA.

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The chief industries are: resort city, and medium size port, three lime and cement works, perfumeries, distilleries, woodworking, food packing.

Accommodation: There are at least 200 hotels with about 10,000 bedrooms; numerous "pensions" and apartment houses. In private dwellings there are about 44,700 rooms available, also many private villas outside the city. Public buildings such as, eight schools, three large casinos, nineteen theatres, large exhibition hall, and several barracks, offer possible accommodation.

e. TOULOUSE:

This is situated midway on the shortest route between the ATLANTIC and MEDITERRANEAN, and is the focus of routes from both the Massif Central to the northeast, and the central PYRENEES to the southwest. It is the junction of seven national highways and six railroad lines, and the connecting point of Canal du MIDI to the MEDITERRANEAN with the GARONNE Lateral Canal to CASTETS, and thence via GARONNE river to the ATLANTIC. It is the terminus of the air service from CASABLANCA and SOUTH AMERICA.

The chief industries are: trading centre, chemicals, explosives, ammunition, aircraft and aircraft parts, shoes brick, tile cement, crockery and glass manufacture.

Accommodation: There are 1,039 rooms in the better hotels, and many more in the lesser establishments. Private dwellings offer an estimated 44,000 rooms. Public buildings such as, University, seven schools, several barracks, offer possible accommodation.

f. ST. ETIENNE:

This is the junction of two national highways, including the main route between LYON and TOULOUSE, and also the junction of railroads leading to LYON, ROANNE, VICHY, and LE PUY.

The chief industries are: iron and steel, based on coal from surrounding area (second largest coalfield in FRANCE), heavy armaments, rifles, ammunition, machine tools, silk cloth, ribbon, velvet, bicycles, automobile parts, glass, dyestuffs, hardware, chocolate, and other foodstuffs.

Accommodation: there are 670 rooms in good hotels, and many other in lesser establishments. 13,000 rooms in private dwellings. Public buildings such as, 8 schools, several barracks, prison, offer possible accommodation.

g. TOULON:

This was previously an important naval base, and is a minor munitions producing centre. Transportation connecting with the interior are poor. It lies on the main coastal road and railway line from MARSEILLE to NICE and the ITALIAN frontier.

The chief industries are: shipbuilding, ship-repair and munition, bauxite mining and alumina production, synthetic gasoline, wine.

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Accommodation: There are 29 hotels with about 1,300 rooms, and about 45 smaller hotels and "pensions"; 17,500 rooms in private dwellings. Public buildings such as, 18 schools and academies, 8 public halls, 7 barracks, and other institutions offer possible accomodation.

The total number of workers (in March, 1943) employed in all departments of the Naval Base and Arsenal is estimated at about 10,000.

h. CLERMONT-FERRAND:

This is a railway junction of north-south and east-west lines, and is at the forks of five national highways, being also on the principal road between LYON and BORDEAUX.

The chief industries are: rubber, Michelin factories, chemicals, munitions, leather, telephone cables, radio transmitters, powder, shoes, clothing, cattle.

Accommodation: there are 900 rooms in good hotels, and 2,500 rooms in good hotels in ROYAT, a nearby spa. The number of habitable rooms in hotels and "pensions" is probably much larger. 16,000 rooms in private dwellings. Public buildings such as, university, seven schools, several barracks, offer possible accomodation.

i. GRENOBLE:

This is in command of several passes to ITALY through the ALPS, notably the MONT CENIS pass and tunnel. It is the focal point for several lines of communication.

The chief industries are: gloves, hydro-electric equipment, radio equipment, cements and lime, rubber, candy, metallurgical products, textiles, synthetic fibres, paper, production of hydro-electric power and light metals and alloys.

Accommodation: There are 1,236 rooms in good hotels, and probably many more in the smaller establishments. 14,500 rooms in private dwellings. Public buildings such as, University, 8 schools, barracks, artillery school, prison, offer possible accomodation.

j. LIMOGES:

This is an important focus of seven highway routes and six railroads from all directions.

The chief industries are: commercial centre, porcelain, enamel, china ware, footwear, leather gloves, hosiery, furniture, boxes, chemicals, machines, tanning, distilling, printing, publishing.

Accommodation: there are 700 rooms in good hotels, and other rooms in second-class establishments, 9,500 rooms are available in private dwellings. Public buildings with possible accommodation are: sections of POITIERS University, formerly located at LIMOGES, eight schools, several barracks.

k. NIMES:

This is a railroad junction and focal point for several coastal routes.

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The chief industries are: wine, textile and leather goods, candy, biscuits, beer, clothing, cattle market.

Accommodation: there are 614 rooms in good hotels, and probably many more in small hotels and "pensions". 13,000 rooms are available in private dwellings. Public buildings with possible accommodation are: seven schools, several barracks, prisons, theatre.

1. MONTPELIER:

This lies on the principal highways and railroad lines from BARCELONA, TOULOUSE and SETE to ARLES, NIMES, MARSEILLE, and was the headquarters of an army corps. It has two broadcasting stations.

The chief industries are: bauxite mines (west of town). The principal products of the area around MONTPELIER are agricultural.

Accommodation: there are 21 good hotels with about 500 rooms, and more in the smaller hotels. 23,000 rooms in private dwellings. Public buildings with possible accommodation are: University, five schools, barracks.

8. Water Supply:

Streams which collect water from four principal regions, the ALPS, the PYRENEES, the CEVENNES and the Central highlands, furnish adequate supply. In some sections, such as the MEDITERRANEAN and AQUITAINE areas, occasionally water shortages may occur in the summer.

The two river systems of the SAONE-RHONE and the GARONNE-GIRONDE Rivers carry most of the runoff.

Annual precipitation varies from 20 to 32 inches in the MEDITERRANEAN lowlands, from 30 to 40 inches in the RHONE Valley, and in the Southern ALPS, from 30 to 80 inches in the CEVANNES and from 20 to 30 inches in the PYRENEES.

Due to the great range in altitude and the proximity of the ATLANTIC Ocean and MEDITERRANEAN Sea, precipitation is erratic and may occur at any time of the year, though the maximum usually occurs in the winter and the minimum in summer.

Water is generally available from wells at the lower altitudes, and in the foothills springs or collecting galleries are numerous. Many of the smaller towns in the hilly regions conduct water by aqueducts for considerable distances. The water is usually hard but otherwise satisfactory.

Wells in the coastal districts frequently supply water from depths of 20 to 150 feet. In the main valleys and foothills wells are from 100 to 500 feet deep.

Usually drinking water is processed only by slow sand filtration and where chlorinated, the standard is below American level. Generally speaking, water is not piped to individual houses but to community fountains. The water supply of MARSEILLE is the worst of any of the large cities, being subjected to treatment only through clarification by settling basins. Persons unused to drinking it are likely to suffer from diarrhea and dysentery, although the inhabitants are somewhat immune.

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In many of the larger cities and industrial towns there is a dual water supply, the water for industrial purposes being pumped direct from streams without any purification, thus making it necessary that precautions be taken to be certain of the system from which drinking water is taken. On account of the ever-present possibility of contamination water should be frequently tested and proper treatment given to ensure safe drinking water.

The fact that sanitary standards and practices, such as washing of clothing in all streams, the careless disposal of night-soil into open streams or use as fertilizer, cause widespread pollution of water supplies, make it necessary to exercise great care in selection and treatment of water.

In 1937 only a little more than one-third of the French communes had water supply systems. Many of these may be considered as modern but in all cases adequate control must be maintained irrespective of the experience and health conditions of the local inhabitants.

In practically all areas where large numbers of troops are likely to be based a sufficient quantity of immediate water supplies may be obtained from existing developed sources, or from streams and springs. In the coastal areas precautions against saline water must be taken. In some instances over-pumping may bring saline water into an existing satisfactory well.

9. Climate:

a. General:

The great diversity of the topography of this region leads to a corresponding variety of climate and weather. There is a tendency to cloud and bad weather on the windward sides of the mountains with fairer weather in their lee and along the south coast, though even here there are marked variations from place to place. The deep cleft of the RHONE Valley induces the intensification of the "Mistral" during spells of northerly winds. Another important climatic feature is the rapid and sudden development of active disturbances in the western MEDITERRANEAN, especially in the Gulf of GENOA and the Gulf of LIONS. The climatic regions are defined by certain general characteristics of temperature and rainfall, the main climatic types being:

(1) Western Oceanic:

Small diurnal and annual range of temperatures and rain all the year with a maximum in winter.

(2) Modified Continental:

Greater range of temperature, and lower rainfall with a summer maximum.

(3) Mediterranean:

Mild wet winters and hot dry summers.

(4) Mountain Climates:

Low temperatures, winter precipitation in the form of snow, strong insolation, and great contrasts due to variety of aspect.

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b. GARONNE Plain: (AQUITAINE)

A strong southeast wind, known as "L'AUTAN" is experienced in this region, and is the cause of a vigorous inflow of warm humid air from the southeast, resulting in much cloud, rain and thick weather. Cold air from neighboring mountains affects the lowland, and there are about 40 days of frost during the year. December to February (incl.) is coldest period with average temperature of 41° F. and July to August is hottest with temperature about 68° F.

Rainfall is fairly evenly distributed, the annual precipitation being less than 20 inches in the GARONNE basin, and the lowland in general having less than 40 inches. The wettest periods are from April to June (inclusive) and from September to December (inclusive) with a peak period in October. (Bordeaux station). Summer rain comes usually in the form of heavy, torrential showers which are normally short lived. Winter rain is mostly in the form of drizzle, and of long duration, with slight evaporation, resulting in soaked ground. Frost makes the ground impenetrable to rain, and flooding may occur due to heavy rain following frost. Snow falls on an average of less than 3 days a year, this figure increasing towards the lower parts of the central Massif, but even there it is below 10 days per year.

Fog occurs most frequently from September to February (incl.). The months with most days of fog are October and January, with an average of 10 and 11 days of fog respectively. Cloudiness is higher in winter than in summer.

c. CENTRAL MASSIF:

The prevailing wind is northwesterly, but this is greatly influenced by the varying topography. The percentage of calm days is on an average 52% - 54% with 60% for the summer period. A south wind blows here all the year round on about 20% of days, this being less frequent, about 12% in the summer. Frost occurs on more than 100 days in the year. December and January are the coldest months with an average temperature of 36° F., and July and August are warmest, with temperatures of about 65° F.

Rainfall is fairly evenly distributed, the annual precipitation in the higher parts being over 47 inches, that over the greater area of the Central Massif being from 31.5 to 47 inches. The wettest period is from May to September (incl.), with a peak period in June (CLERMONT-FERRAND Station). Summer rain consists usually of heavy showers of short duration while winter rain is in the form of drizzle of long duration. Flooding may occur when heavy rain follows frost. Snow falls on an average of over 50 days a year in the higher parts, decreasing to an average of 10 to 20 days in the lower slopes and even under 10 days towards the lowland. Northwest of the AUVERGNE mountains there is a considerable winter snowfall, but this thaws frequently even at higher levels. Thunderstorms are very numerous, occurring on an average of 25 days per year (PUY DE DOME), sometimes with hail.

Visibility is generally good, but there may be some slight morning fog in winter, probably confined to the environs of the large towns.

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d. RHONE Valley:

The "Mistral", a northerly or northwesterly wind, blows down the RHONE Valley, and is remarkable for its strength, cold, and dryness. It occurs in any month of the year, even in summer, but is most prevalent in winter and early spring. The number of days per year of frost is between 60 to 80, though this may decrease to 40 days further south. Cold air from the neighboring mountains affects the valley. The coldest period is during December and January with an average temperature of 35° F. and June to August (incl.) is the warmest with the temperature about 66° F.

Rainfall is fairly evenly distributed, the annual precipitation being from 31 inches to 47 inches, this decreasing farther south to 23 inches. The wettest period is from May to October (incl) with a peak period in October (LYON Station). Summer rain is in the form of short showers, while winter rain takes the form of drizzle of long duration. Flooding may occur when heavy rain follows frost. Thunderstorms are numerous, sometimes with hail, LYON having these on an average of 37 days per year. Snow falls on an average of less than 10 days per year.

Visibility is good, there being little fog and only slight cloudiness in winter. Continuous low cloud may accompany the strong squalls which herald the onset of a widespread mistral.

e. ALPS:

The winds in this region are very variable. A south wind blows strongly through the gap between the ALPS and PYRENEES and brings warm air but rough and rainy weather to the whole of FRANCE. There are over 80 days per year of frost. The January temperature varies from 36° in the lower slopes to below freezing point in higher altitudes, while summer temperatures in July vary from 65° to below 59° F.

Rainfall in the higher areas exceeds 79 inches per year, but in the lower pre-ALPS to the west this falls as low as 32 inches. The wettest months are October and November, with approximately 4 inches of rain per month, as experienced at GAP in the HAUTES ALPES. These figures increase considerably further north. Snow falls on more than 50 days in the year in many areas, this decreasing in frequency towards the west, averaging about 10 days near the RHONE Valley. Conditions of road communications differ due to variations, not so much in the duration as in the quantity of snow from one valley to another. First class main roads can generally be kept passable up to 3,900 feet.

Visibility is good, the air being very clear in this region.

f. MEDITERRANEAN Coastland:

Winter is the stormy season, gales being very rare in summer. The "mistral" or north wind, may be experienced anywhere, particularly between MARSEILLE and PERPIGNAN. The "Marin", a strong southeast wind, blows in the Gulf of LYON and reaches as far inland as the foot of the CEVENNES and PYRENEES, and into the CARCASSONNE Gap. This vigorous

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inflow of warm humid air from the southeast, causes much cloud, rain and thick weather. Frost occurs on less than 20 days per year. The coldest period is from December to February (incl) with an average temperature of 44° F. while the hottest months are July and August with average temperatures of about 72° F.

Rainfall is very slight in summer as this region lies south of the rain bearing southwesterly winds, and comes under a high pressure belt of light winds and drought. This causes a dry summer season, the coastal strip having less than 1 inch of rain in July. The annual precipitation over the whole region is between 31 inches and 23 inches, this decreasing towards the coast. The wettest month is October, with 4 inches of rain, as recorded at MARSEILLE. The rainfall is heavier further east along the MEDITERRANEAN coastline, the October figure at DRAGUIGNAN being 6 inches. Serious waterlogging may occur due to the low rate of evaporation, causing the ground to soak up most of the water. Frost makes the ground impenetrable to rain, causing flooding when heavy rain follows frost. This area averages only 2 or 3 thunderstorms a year, those in summer occurring with the south winds. In late summer and autumn they occur, mainly near the coastline. Snow is seldom experienced, there being only about 3 days with snowfall during the year. It is however, more frequent further inland towards the mountain slopes, but even there it does not occur on more than 10 days per year.

Visibility is in general quite good, but strong east winds may bring cloud to the MEDITERRANEAN area in winter. Land fog is most frequent in the winter months, at night or early morning, especially in the lowlying areas. Sea fog is most frequent in early summer during the afternoon, and may be carried inland some short distance by sea breezes. Land fogs may drift out to sea but are usually quickly dispersed. Thus coastal regions are subject to fogs from both directions, though along the MEDITERRANEAN littoral, it is sunny and clear even in winter.

g. PYRENEES:

The strong southeasterly wind, known as the "Marin", is experienced at the foot of the PYRENEES near the Gulf of LIONS. This vigorous inflow of warm, humid air from the southeast, results in much cloud rain, and thick weather. The temperature varies considerably with altitude and distance from the sea. In the lower slopes the January temperature is about 41° F., decreasing to below freezing point in the higher areas. The July temperature in the lower slopes is about 68° F., decreasing with height to below 59° F.

Rainfall in the higher parts exceeds 80 inches per year, this decreasing to 31 inches in the lower areas, and to 24 inches in the slopes to the northeast. The wettest period is from December to April (incl.) with a peak period in January with about 7 inches of rain. The driest months are July and August (PIC du MIDI Station in HAUTES PYRENEES). Here again flooding may occur when heavy rain follows frost. Waterlogging may be caused in winter, due to low evaporation in the damp atmosphere, permitting the water to soak into the ground. Thunderstorms are frequent in the more mountainous areas, occasionally with hail. Snow is not common

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in the northern slopes, falling on less than 10 days per year. Toward the summits this naturally increases, falling on more than 50 days per year in the higher regions. In parts of the eastern PYRENEES, notably the upper TET-SEGRE valleys, the quantity of snow is considerably smaller than that in the valleys draining northward; several high-level roads, therefore, remain passable throughout the winter. Elsewhere all the passes above 3,600 feet are blocked for a period each winter.

Visibility is good, the air being very clear throughout the area.

10. Electrical Power:

a. General Characteristics:

FRANCE has exploited both her coal and water power resources to generate electricity. About 90% of the hydroelectric plants in FRANCE are located south of a line extending roughly from LA ROCHELLE to GENEVA, while the greater proportion of thermal plants is in northern FRANCE. In general, power flows from southern FRANCE to the northern industrial areas.

In 1941, total French electric power output amounted to 18,500 million kwh, of which 11,500 million kwh were hydro-generated. The thermal plants of the north and the hydro-plants of the south are linked by a high-tension grid system of 150 kV and 220 kV. Serious or total disruption of the power system of southern FRANCE would require very extensive demolitions, because of the large number of generating plants and the complexity of grid inter-connections.

b. Hydroelectric Plants:

The hydro plants of the southern region are concentrated in three areas: ALPS, PYRENEES and MASSIF CENTRAL, each of which is characterized by a different hydrology.

THE ALPS system is glacier-fed and experiences a marked shortage during the winter. Its minimum capacity occurs in February and may be less than 50% of its maximum capacity, which is obtained during May through July.

The MASSIF CENTRAL experiences its low water period during the summer. The capacity in August is about 20% of the capacity in March.

The PYRENEES share characteristics of both the ALPS and of the MASSIF CENTRAL. Peak capacity is obtained in June, with minor peaks in October and December. The lowest period occurs in January and February, when its capacity is about 40% of the peak, followed by another low period in August and September.

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c. Power Plants in Southern FRANCE:

Capacity Range (KW)	<u>Thermal</u>		<u>Hydro</u>		<u>Total</u>	
	<u>Plants</u>	<u>Capacity</u>	<u>Plants</u>	<u>Capacity</u>	<u>Plants</u>	<u>Capacity</u>
100,000 & over	-	-	3	399,000	3	399,000
50,000-100,000	6	457,500	3	209,500	9	647,000
30,000-50,000	2	69,000	11	409,500	13	478,500
20,000-30,000	7	158,000	16	402,500	23	561,400
10,000-20,000	10	141,000	40	531,850	50	673,050
5,000-10,000	12	76,800	59	422,400	71	499,200
TOTAL	37	883,400	132	2,374,750	169	3,258,150

The three largest installations, (BROMMAT, SARRANS, and MAREGES), are all in the MASSIF CENTRAL.

d. The power grid of Southern FRANCE:

The southwestern quarter of FRANCE is served by a ring network made up of 220 kV and 150 kV lines running from DISTRE through EGUZON, MAREGES (La MOLE), RUEYRES, VIVIEZ, ST. VICTOR, PORTET - ST. SIMON, LANNEMOZAN, JURANCON, DAX, PESSAC, FLEAC, CHOLET, and back to DISTRE.

The 220 kV line from RUEYRES to CHEVILLY via La MOLE - EGUZON - CHAINGY supplies the PARIS area with hydro-electric power from the MASSIF CENTRAL. It also serves the PARIS-ORLEANS electrified railway.

The 220 kV line EGUZON - DISTRE is the main link between MASSIF CENTRAL and the west coast.

The west coast is supplied by a 150 kV line running up the western seaboard, carrying PYRENEES power transmitted through JURANCON and LANNEMEZEAN.

A 120 kV line, LINGESTIERE - BANCAIRON - STE. TULLE - GAVOTTE, connects the south-east corner of FRANCE with the rest of the French power grid.

e. Local Electricity Supplies:

Almost all French electricity is generated as three-phase 50-cycle alternating current, which is practically universal for house-to-house supplies. Southeastern FRANCE (roughly the area served by the line GAVOTTE-STE.TULLE-BANCAIRON-LINGOSTIERE) uses 25 cycle.

In some towns, direct current, obtained from A/C by use of mercury-arc rectifiers, is used, and some localities use both A/C and D/C. Voltages are not standardized. Industrial enterprises ordinarily use high voltages, such as 5,000 and above. Transforming and rectifying, if either is necessary, is done within the factory area with factory owned equipment. The most common voltages furnished for household use are 110, 115, 120 and 200, 210, 220.

11. Medical and Hygiene:

Apart from venereal diseases and tuberculosis, communicable diseases are reported to be of low incidence. Under normal conditions, the most important are:

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a. Tuberculosis:

This is a serious public health problem, especially in rural areas. The average national death rate is 57.8% higher than that in the U.S.A. An increase of from 20% to 30% in incidence of the disease in persons between the ages of 20 and 40 was reported in 1943. The gravity of the situation has been greatly heightened by the return of tubercular prisoners of war from GERMANY, and by the general scarcity of food, clothing, fuel and shelter.

b. Venereal Diseases:

These are widespread and constitute a serious problem. The normal rigid controls on prostitution by the government are reported to have broken down, and infection is reported to have spread rapidly among GERMAN troops. Venereal diseases constitute one of the major health problems confronting any invading or occupying troops.

c. Typhoid and Paratyphoid:

Most prevalent in the MEDITERRANEAN port cities, apparently as a consequence of shipping. Indications exist of occurrence of typhoid in severe epidemic form in 1941 and 1942, primarily in the MEDITERRANEAN region. Anti-typhoid inoculation would be needed by occupying forces. The widespread contamination of the water supply affords a favourable avenue for spreading these diseases.

d. Diphtheria:

This attained the proportion of a minor epidemic in the RIVIERA in 1941, with the added problem of a shortage of serum. It might easily develop an epidemic among non-immunised troops.

e. Typhus and other Insect-borne Diseases:

The flea-borne type of typhus is still endemic in Southern FRANCE. MARSEILLE is reported to have had numerous cases in the winter of 1941-1942, of the louse-borne variety, although it did not reach the proportion of a major epidemic. The tick-borne MARSEILLE fever (fievre boutonneuse) is endemic in the region of the MEDITERRANEAN coast. Malaria is now confined to the marshy, deltaic CAMARGUE region, but there it constitutes a constant threat and may be expected to spread, especially in the absence of quinine. The mosquito-borne dengue fever is also endemic in the MEDITERRANEAN area.

f. Dysentery:

There are outbreaks of this, apparently centering in refugee camps. Both the amoebic and bacillary forms are endemic to the region. Travellers especially are subject to dysentery, probably due to inadequate food and water sanitation.

g. Undulant Fever:

This is transmitted in the milk and cheese obtained from goats and sheep and in water contaminated by these animals. It has been reported in HERAULT and neighbouring departments in recent years.

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h. Smallpox, Scarlet Fever and Measles:

There were outbreaks of smallpox in the RIVIERA district in 1942, and it is unlikely that sufficient vaccine is available for re-vaccination of the entire population.

i. Infectious Jaundice:

Rats, the carriers of infectious jaundice (leptospirosis) are widespread and are known to harbour the causative agent of this disease in many areas. Outbreaks have been reported.

j. Other Diseases:

Arebrospinal meningitis is endemic and its occurrence is exceptional. Meningococcus meningitis has been reported recently. Skin diseases are common, especially scabies. Precautions against exposure should be maintained to prevent pneumonia, influenza, etc.

k. Hygiene and Sanitation:

There is a great deal of contamination and pollution in the water supply. The slow sand filtration treatment, and chlorination, does not meet military standards. The water supply of MARSEILLE is the worst of that of any of the large cities, being subjected only to clarification by standing in settling basins. It is liable to cause dysentery and diarrhea. All water supplies should be regidly inspected and tested before use.

Sewage disposal is very primitive. Only 25% of the systems in use are adequate by modern standards. In villages, the sewage may be dumped into open gutters which drain directly into the streams. Night soil and sludge are used for fertiliser, therefore agricultural products must be carefully inspected.

There may be a great shortage of medical supplies in FRANCE. Troops will need to bring supplies sufficient not only for their own needs, but also for the inhabitants as well.

l. Hospitals:

In this area there are a total number of 753 hospitals providing accommodation for 85,876 beds. The detailed breakdown of these figures by towns is not available at present.

12. Bulk Fuel Installations:

a. Petroleum Refineries:

(1) S.A. des Petroles Jupiter at PAUILLAC (GIRONDE) had a through-put capacity of 550,000 metric tons per annum. Many working tanks were burnt out in February 1942, and the plant is reported as unopenable.

(2) S. de Raffineries de Petrole de la GIRONDE at BEC D'AMBES (GIRONDE) had a through-put capacity of 220,000 m.t.p.a.. This too is reported as unopenable due to moderate damage and no repairs.

(3) Cie. Industrielle des Petroles, S.A.F. at FRONTIGNAN - CETTE (HERAULT) has a through-put capacity of 210,000 m.t.p.a.

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(4) Cie. Francaise de Raffinage at MARTIGUES-CARONTE (BOUCHES DE RHONE) has a through-put capacity of 900,000 m.t.p.a. Very slight damage, and up to July 1942 no repairs had been effected.

(5) Cie des Produits Chimiques et Raffineries de Berre at BERRE (BOUCHES DU RHONE) has a through-put capacity of 500,000 m.t.p.a. This is reported as intact.

(6) S.G.H.P. at MARTIGUES-CARONTE (BOUCHES DU RHONE) has a through-put capacity of 550,000 m.t.p.a. It is reported inactive.

b. Storage Tankage:

The total tank capacity in Southern FRANCE is given as 1,317,583 metric tons. It is of significance that approximately 95 percent of this capacity is located in seaboard areas, mainly in the regions of BORDEAUX and MARSEILLE. Appendix "G" contains a complete list of the tankage locations and capacities including the various companies. Stocks of any kind of petroleum product must, by now, have been exhausted.

c. Production Centres:

(1) The oil-field at ST. GAUDENS in the northern foothills of the PYRENEES was discovered shortly before the outbreak of war, and the government-dominated Societe Nationale de Petrole d'AQUITAINE was formed to exploit it. Drilling of 11 or 12 wells is in progress, the total production for the period 1941-42 being 335 tons. Further prospecting is to be undertaken to the northwest, near BOULOGNE-sur-GESE. The poor yields so far are ascribed to lack of the proper drilling equipment and of experienced technicians and geologists.

(2) There are synthetic hydrocarbon projects intended at four places: AIX-en-PROVENCE, ST. LOUIS, PEYROUZET and BOUSSENS, and LA PEYROUSE. No results have yet been obtained, though the AIX-en-PROVENCE plant, when finished, was planned to produce 25,000 tons of synthetic gasoline and 25,000 tons of methanol per annum. The ST. LOUIS plant was to be erected at the sugar refinery there, the presumed production being 14 tons of gas oil daily.

13. Military Aspects of the Terrain:

a. Operational Features:

(1) The natural corridors of the GARONNE and RHONE Valleys, leading to Western FRANCE and Western GERMANY, with their important road, rail and canal communications and numerous towns.

(2) Absence of favourable landing beaches west of the RHONE delta.

(3) Several excellent beaches on the RIVIERA, close to the key ports of TOULON and MARSEILLE and adequate exits to the main communications network.

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(4) The three great mountain barriers of the PYRENEES, MASSIF Central and ALPS, which are penetrable but not suitable for large scale employment of mechanized forces.

(5) Featureless gravel plain east of RHONE delta, favourable to use of armoured force vehicles.

b. Obstacles:

(1) Extreme canalisation of roads and railways through major valleys, with few localities favourable to deployment.

(2) Strong turbulent current of the RHONE River, which will require major bridging operations.

(3) Difficulty of widespread deployment of vehicles in the three mountain areas.

(4) Ease with which enemy may select numerous alternative defense lines.

(5) Extensive marshes in RHONE Delta.

c. Tactical Effect of the Terrain:

(1) The most suitable beaches for an amphibious operation against Southern FRANCE are located east of the port of TOULON but exits are onto strongly canalized communications.


(2) An advance from the PO Valley across the ALPS would be severely restricted by the ease with which mountain passes and coastal areas may be defended.

(3) The RHONE Valley is a natural route of advance into the heart of enemy territory, in the highly industrialized middle RHINE Valley, but it affords the enemy with numerous excellent defense positions.

(4) An advance up the RHONE would necessitate using the roads and railways on both banks, which will require a major bridging operation, since the RHONE is one of the swiftest and most turbulent rivers in EUROPE.

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Annex "B"

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APPENDIX "A"

(One photostat)

TOPOGRAPHICAL MAP OF SOUTHERN FRANCE

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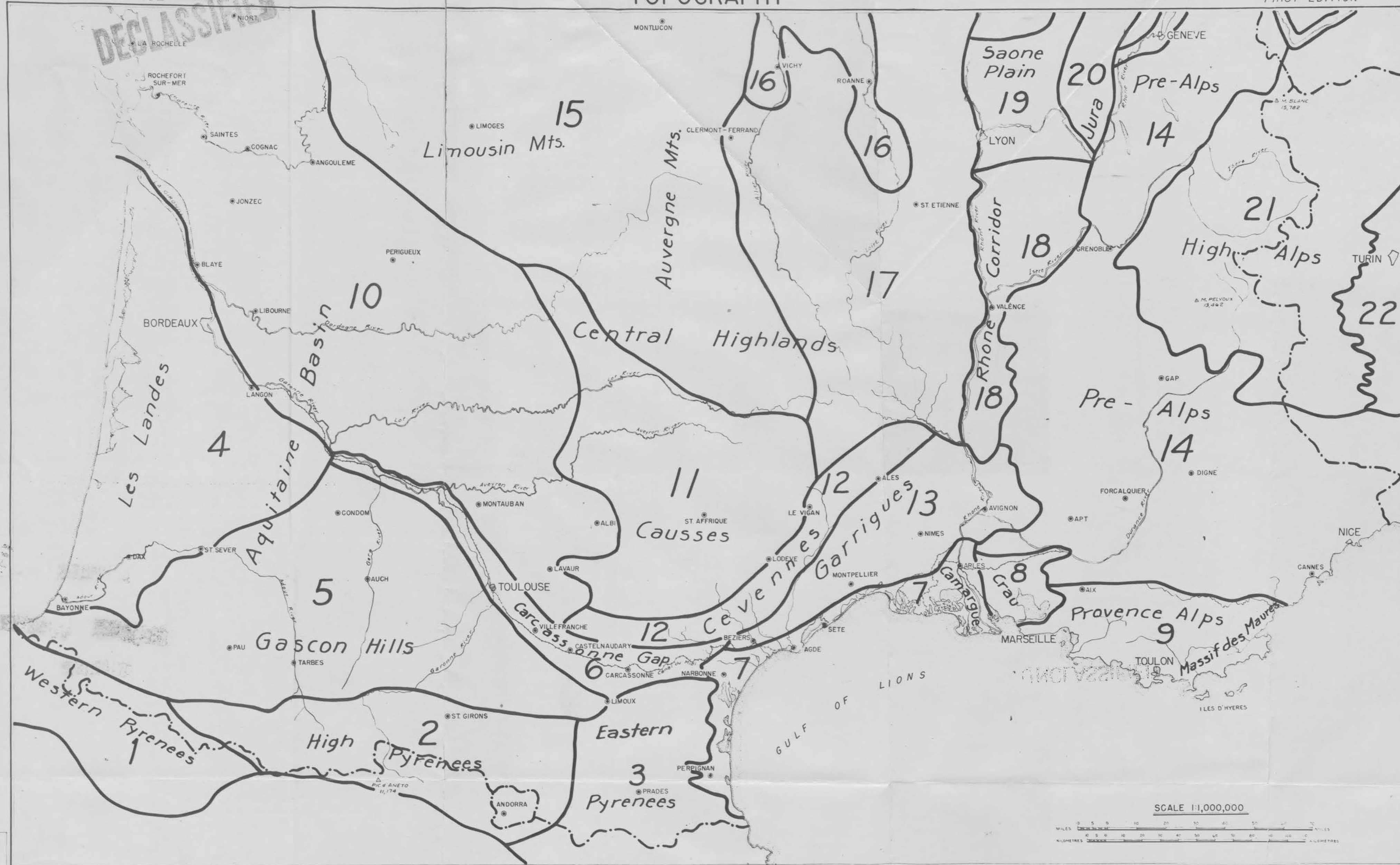
Appendix "A"

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SOUTHERN FRANCE

TOPOGRAPHY

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FIRST EDITION



SCALE 1:1,000,000

LEGEND

1. Western Pyrenees - rugged low mountains.
2. High Pyrenees - rugged high mountains.
3. Eastern Pyrenees - rugged low mountains.
4. Aquitaine Basin - "Landes", flat sandy plain.
5. Aquitaine Basin - Gascon Hills, low rolling hills.
6. Aquitaine Basin - Carcassonne Gap, narrow rolling plain.
7. Mediterranean Lowland - flat or undulating coastal plain with lagoons and marshes.
8. Mediterranean Lowland - "Crau", flat pebble-paved plain.
9. Provence Alps - rugged low mountains.
10. Aquitaine Basin - low limestone plateaus with steep-walled valleys.
11. Central Highlands - "Causse", hilly upland cut by gorges.
12. Central Highlands - Cevennes Mts., rugged low mountains.
13. Mediterranean Lowland - low coastal hills.
14. Pre-Alps - rugged low mountains.
15. Central Highlands - Auvergne - Limousin highlands, rolling upland with scattered peaks and volcanoes.
16. Upper Loire - Allier Valley - rolling river plains.
17. Upper Loire - Allier Highlands - rough high hills with escarpment towards Rhone Valley.
18. Rhone Valley - Plains interrupted by east-west ridges.
19. Lyon Lowland - flat or undulating plain.
20. Jura Mountains - rugged low mountains.
21. High Alps - rugged high mountains.
22. Po Valley - Piedmont, rolling or undulating hills.

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APPENDIX "B"

(One photostat)

ROAD MAP OF SOUTHERN FRANCE

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Appendix "B"

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APPENDIX "B"

SOUTHERN FRANCE

ROADS

FIRST EDITION



REFERENCES USED:
G.S.G.S. 2758, Europe, 1:1,000,000
G.S.G.S. 2738, France, 1:250,000
G.S.G.S. 4238, Europe Road Map, 1:200,000

LEGEND

Main Traffic Routes

Scale: 1:1,000,000



Revised by 11 Map Revision
S. R. D. 143 1/11/50
Compiled by G.I. (Topo), G-2 Section
Allied Force Headquarters
First Edition, 17 December 1943

G-2/1604

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APPENDIX "C"
SOUTHERN FRANCE
Road Distances

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All distances are in miles and are approximate only.
Main routes have been followed in many cases and not necessarily the shortest route.

	ANGOULEME	AVIGNON	BAYONNE	BEZIERS	BORDEAUX	CARCASSONNE	CLERMONT - FERRAND	GRENOBLE	LA ROCHELLE	LIMOGES	LYON	MARSEILLE	MONACO	MONT DE MARSAN	MONTPELIER	NICE	NIMES	PERIGUEUX	PERPIGNAN	ROANNE	ST. ETIENNE	ST. GAUDENS	TOULON	TOULOUSE	VALENCE	VICHY
ANGOULEME	0																									
AVIGNON	340	0																								
BAYONNE	211	397	0																							
BEZIERS	320	108	270	0																						
BORDEAUX	70	343	108	274	0																					
CARCASSONNE	255	272	225	51	223	0																				
CLERMONT FERRAND	156	185	335	190	200	242	0																			
GRENOBLE	338	130	460	238	415	400	205	0																		
LA ROCHELLE	66	406	213	379	105	330	225	430	0																	
LIMOGES	64	275	234	260	126	217	92	297	120	0																
LYON	268	138	415	240	312	291	112	70	337	204	0															
MARSEILLE	383	59	405	165	365	216	244	145	450	336	197	0														
MONACO	513	173	570	262	516	313	358	167	579	450	311	145	0													
MONT DE MARSAN	151	337	60	230	81	177	260	467	186	175	365	385	510	0												
MONTPELIER	325	58	325	50	283	101	187	188	391	268	182	100	231	280	0											
NICE	501	161	540	250	505	300	346	155	567	436	225	133	12	480	200	0										
NIMES	325	26	357	85	295	136	175	156	391	253	150	70	199	310	32	170	0									
PERIGUEUX	53	280	175	265	69	222	130	335	117	60	242	335	453	115	245	441	260	0								
PERPIGNAN	328	163	357	55	286	73	245	293	391	280	295	220	322	240	105	310	140	285	0							
ROANNE	225	193	410	275	272	311	72	125	297	164	55	252	366	335	210	280	205	202	330	0						
ST. ETIENNE	241	148	378	230	279	266	85	120	310	177	33	207	254	340	165	242	152	215	285	45	0					
ST. GAUDENS	273	264	133	158	160	107	248	394	265	213	310	323	412	104	206	400	238	218	140	320	278	0				
TOULON	428	93	458	198	400	250	278	223	505	356	231	33	98	425	133	86	103	368	253	286	241	356	0			
TOULOUSE	218	214	160	108	166	57	195	344	271	160	260	273	387	120	156	356	188	165	120	270	225	53	291	0		
VALENCE	281	75	400	180	300	231	125	58	347	217	63	134	197	410	128	185	98	277	235	120	57	338	168	240	0	
VICHY	187	106	360	600	608	671	60	167	650	120	85	255	166	300	671	167	106	360	600	608	671	60	167	650	120	85

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APPENDIX "D"

(One Photostat)

RAILWAY MAP OF SOUTHERN FRANCE

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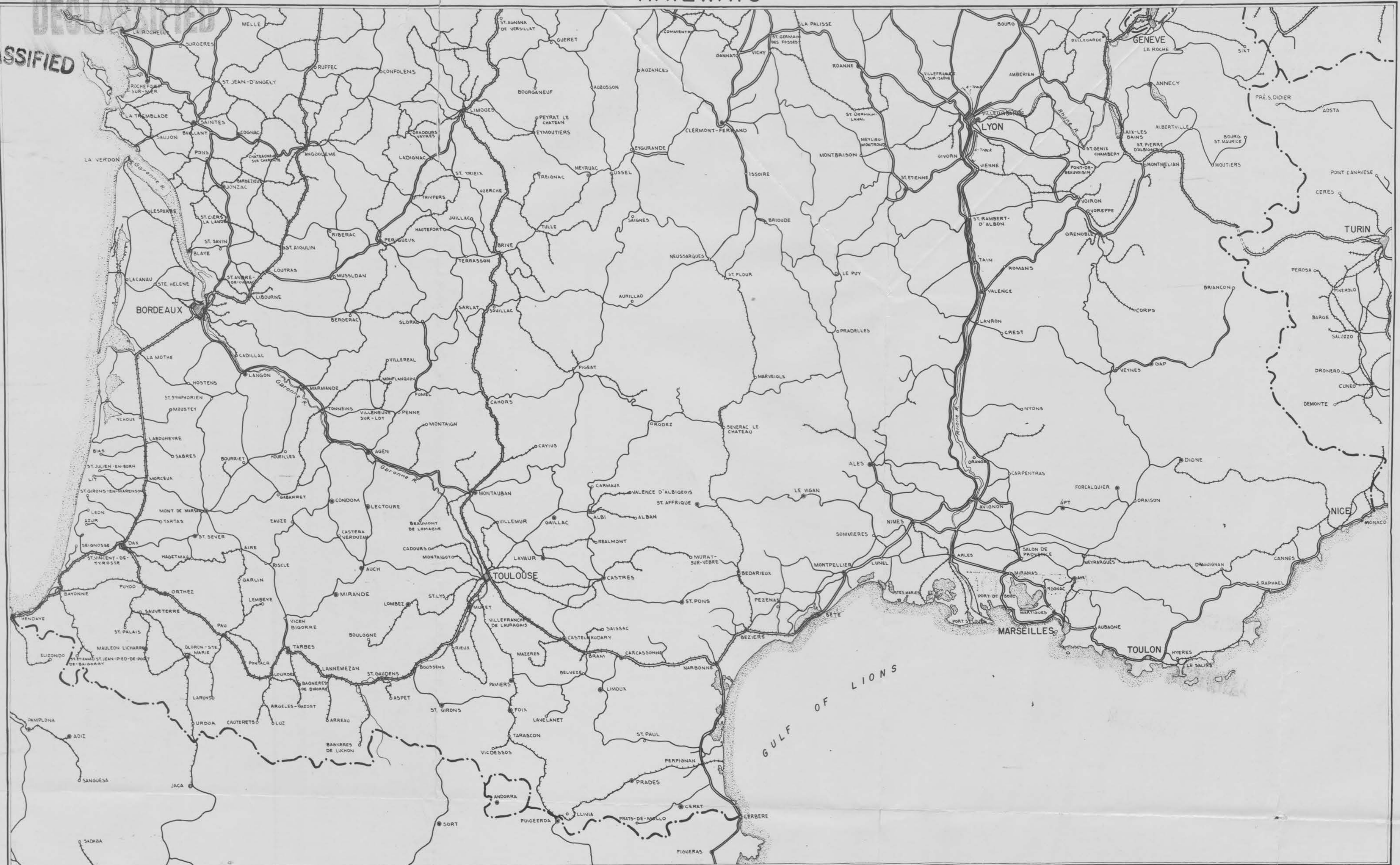
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SOUTHERN FRANCE

RAILWAYS

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G-2/1588

LEGEND

Standard Gauge Double Track (4'-8 1/2")
 Standard Gauge Single Track
 Standard Gauge Track with third rail
 for use by Narrow Gauge
 Narrow Gauge Double Track [2'-6" (760mm)]
 except where otherwise indicated
 Narrow Gauge Single Track
 Standard Gauge under construction or projected
 Narrow Gauge under construction or projected
 Line being doubled
 Narrow Gauge being converted to Standard Gauge

Steam

Electric

SCALE: 1:1,000,000

MILES 0 10 20 30 40 50 60 70 80 90 100
 KILOMETRES 0 10 20 30 40 50 60 70 80 90 100

Compiled by OI (Topo), G-2 Section
 Allied Force Headquarters
 First Edition, 9 December, 1943

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APPENDIX "E"

PORTS IN SOUTHERN FRANCE

PORTS on MEDITERRANEAN COAST BETWEEN FRANCO - ITALIAN and FRANCO - SPANISH Frontiers

NOTE: 1. Berths in Column c. below are classified as follows:-

Class 'A' berth will take a ship 600 ft. long and 30 ft. draught.

"	'B'	"	"	"	"	450	"	"	"	26	"	"
"	'C'	"	"	"	"	450	"	"	"	20	"	"
"	'D'	"	"	"	"	350	"	"	"	20	"	"
"	'E'	"	"	"	"	250	"	"	"	16	"	"
"	'F'	"	"	"	"	200	"	"	"	12	"	"

2. The capacity shown in Column e. below is the average daily figure that could be discharged and cleared over a period, assuming shipping is available to work all alongside berths.

Place	Position	Number of alongside berths (NOTE 1)	Normal clearance facilities	Capacity Long tons D.W. per day (NOTE 2)	Remarks
a.	b.	c.	d.	e.	f.
MENTON	43° 47' N 07° 31' E	4F	Road only	600	The harbor is liable to silting and exposed to easterly winds. There is a small hard at the root of the jetty with depths of 10 ft. at edge. Direct exist on to road.
MONACO	43° 44' N 07° 26' E	4C, 3F, 1F and 3B stern to (25' draught)	Road and rail. (Single line only)	1,500	Entry is difficult in easterly winds. If all stern to berths are occupied harbor would be very congested. Eight mooring buoys 100 yds east of wall. Ships can berth with anchor down and stern secured to the buoys.
VILLEFRANCHE	43° 42' N 07° 20' E	2D on mole. Landing craft at quays.	Road and rail from town station	400	Coasters only but with good anchorage in the bay. Loading facilities at town station very limited.

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Place a.	Position b.	Number of alongside berths (NOTE 2) c.	Normal clearance facilities d.	Capacity Long tons D.W. per day (NOTE 2) e.	Remarks f.
NICE	43° 41' N 07° 17' E	6D, 6E, 2F.	Road and rail from town station	2,500	Draught limit 22'. Length limit 410'. Anchorage at VILLEFRANCHE.
ANTIBES	43° 35' N 07° 08' E	2E, 1F.	Road and rail from town station	500	Small coasters only. Clearance from mole quay not good. Bulk oil storage facilities are available.
CANNES	43° 33' N 07° 01' E	3E, 3F.	Road and rail from town station	600	Small coasters only. The reported new harbor works are not seen on air photographs, and may have been confined to extensive dredging only.
ST. RAPHAEL	43° 25' N 06° 46' E	1D.	Road and rail from town station	300	A small harbor with a difficult entrance, exposed to southerly winds.
ST. MAXIME	43° 18' N 06° 38' E	Landing craft only.	Road only	-	
ST. TROPEZ	43° 16' N 06° 38' E	2F and landing craft	Road only	400	Small coasters only. Mole 300' long.
TOULON	43° 07' N 05° 56' E	11A, 11B, 8C, 10D, 10E, 18F. The above berths include those in the Naval harbor NOT already blocked.	Road and rail.	10,000	A first class port and Naval base. Clearance from some of the berths in the Naval harbor would be difficult. The numerous dry docks have not been included as possible berths, but could be adapted to accommodate 6A, 3B, 1C, 2D, 1E, 2F.
PORT DE LA SEINE	43° 06' N 05° 55' E	1C, 2E, 11F.	Road and rail.	1,000	A satellite port in the Bay of TOULON.
LA CIOTAT	43° 10' N 05° 37' E	2E alongside and 1A at buoy outside harbor. Landing craft.	Road and rail from town station	600	Clearance facilities are not good. Berths are alongside in or across head of Dry Dock. Lighter quays.

Appendix "E"

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Appendix "E"

Place a.	Position b.	Number of alongside berths (NOTE 1) c.	Normal clearance facilities d.	Capacity Long tons D.W. per day (NOTE 2) e.	Remarks f.
CASSIS	43° 12' N 05° 32' E	Landing craft only	Road.	-	650' of quays with 3' alongside. 18' in harbor.
MARSEILLE	43° 20' N 05° 20' E	22A, 45B, 15C, 20D, 15E, 2F.	Road and rail.	20,000 with spare berths.	The best port in France.
PORT DE BOUC (incl. Martigues)	43° 24' N 04° 59' E	PORT DE BOUC 6C, 11F, and 1 tanker. Possibly also 2E berthed alongside mole and discharge to lighters on landward side (see remarks) MARTIGUES. 2C.	Road and rail.	3,000	Mole is built on foundation of boulders and is rough faced on inner side. It is not known whether ships can berth alongside. Berths include those in CANAL D'ARLES and CANAL MARITIME. The North quay at MARTIGUES appears to be broken in several places and is not considered suitable for berthing. Easily blockable entrance where depth of 31 ft. is maintained by dredging. A channel dredged to 29 ft. leads to the entrance of CANAL MARITIME which is in turn dredged to 27 ft.
ETANG DE BERRE		2 Tankers, 20' draught.		650 tons per hour.	If dredging has been maintained depths up to 26 1/2 ft. are available.
ST. LOUIS DU RHONE	43° 23' N 04° 29' E	8C. 1 Tanker Berth.	Road and rail.	2,000	Can take coasters up to 20' draught.
SETE	43° 24' N 03° 41' E	20C, 5D, 10E, 22F. 1 Tanker Berth.	Road and rail. Destruction of swing bridges in port area would severely limit clearance capacity.	7-8,000	Ships drawing over 23 ft. cannot enter the port. Swing bridges have to be negotiated before several of the berths can be worked.
AGDE	43° 17' N 03° 27' E	Landing craft only.	Road and rail from town station.	-	A canal port with about 450 yds of quay with 10 ft. water alongside on west bank.

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Place <u>a.</u>	Position <u>b.</u>	Number of alongside berths (NOTE 1) <u>c.</u>	Normal clearance facilities. <u>d.</u>	Capacity Long tons D.W. per day (NOTE 2) <u>e.</u>	Remarks <u>f.</u>
LA NOUVELLE	43° 01' N 03° 04' E	8F and landing craft (incl. 2F in turning basin)	Road and rail.	600	A canal port with 1,800 ft of quayage on south wall and 720 ft of quayage in turning basin. Harbor is liable to silting, and it is unsafe to rely on depths of more than 15 ft. There may be still less water if port has not been maintained.
PORT VENDRES	42° 31' N 03° 07' E	1B, 4C, 1D, 1F.	Road and rail.	1,500	Good anchorage in depths of about 112 ft. about 1/2 mile north of POINTE DU FANAL. With high winds from the N.E. vessels bump badly at Quay de la Presqu'ile and have to anchor in the road or Avant Port.

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APPENDIX "F"

To Tactical Study of the Terrain SOUTHERN FRANCE
dated December 1943.

T O W N S

POPULATION AND OCCUPATIONS

LEGEND

Agri. = Agricultural
Indust. = Industrial
Cattle = Cattle raising

TOWN	POPULATION	REMARKS
AGDE	9,242	
AGEN	27,152	Chemical equipment.
AIX-EN-PROVENCE	42,615	Synthetic oil.
AIX-LES-BAINS	12,889	Electrical Industry.
ALBERTVILLE	7,055	
ALBI	30,293	Synthetic fibres, iron & steel plants.
ALES	41,385	Coal mining, steel.
ALLAUCH	8,351	
AMBERIEU	6,846	Plane assembly.
AMBERT	6,877	Rosary manufacture.
AMPLEPUIS	5,472	
ANGLET	11,320	
ANGOULEME	38,915	Canneries, distilleries, explosive plant.
ANNECY	23,293	Dairies, distilleries, ball-bearings.
ANNEMASSE	8,018	
ANNONAY	15,669	Leather, paper mills.
ANTIBES	25,014	Plane repairs.
APT	6,201	Candied fruit & nougat, other deposits.
ARCACHON	13,102	Fishing & Canning. (1058 fishermen).
ARLES	29,165	Distilleries, dairies.
AUBAGNE	13,949	Alumina plant.
AUBENAS	8,020	Silk depot.
AUBIN	7,495	Surface coal.
AUBUSSON	5,830	Carpet & tapestry works.
AUCH	13,313	Wines.
AURILLAC	19,041	Flour mills, distilleries, dairies.
AVIGNON	59,472	Dairies, distilleries & some flour mills, rayon.
BAGNERES-DE-BIGORRE	8,633	Armaments & munitions, aircraft.
BARGERAC	18,902	Explosive plant.
BAYONNE	31,350	Distilleries, dairies, cold storage plants, oil storage, industrial acids.

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TOWN	POPULATION	REMARKS
BEAUCAIRE	10,059	Cement.
BEAUSOLEIL	11,826	
BEDARIEUX	8,512	Iron & steel plants.
BEGLES	20,989	
BELLEGARDE	5,071	
BELLEY	5,815	
BERRE-L'ETANG	5,998	Synthetic fibres, plane parts.
BESSEGES	5,425	Colliery.
BEZIERS	73,305	Wine-trade.
BIARRITZ	20,691	Plane assembly.
BOLLENE	5,039	
BORDEAUX	258,348	See main paragraph.
BOUCAU	5,568	Iron & steel plants.
BOURG	24,746	Flour mills, wineries, cold storage plants.
BOURG-DE-PEAGE	6,301	
BOURG-LES-VALENCE	6,772	Indust.
BOURGOIN	7,465	Indust.
BRIANCON	7,543	Nearby chalk quarries.
BRIGNOLES	5,534	Olive-oil, tanneries, bauxite wines.
BRIOUDE	5,039	Machine tools.
BRIVE-LA-GAILLARDE	29,074	Electrical industry.
BRON	13,161	
CAGNES-SUR-MER	9,038	
CAHORS	13,269	Canneries, wineries.
CALUIRE-ET-CUIRE	15,760	Aircraft.
CANNES	49,032	Plane parts and assembly.
CAPDENAC-GARE	5,431	
CARCASSONNE	33,441	Flour mills, distilleries.
CARMAUX	10,448	Coal mines.
CARPENTRAS	13,732	
CASTELNAUDARY	8,246	
CASTELSARASSIN	7,768	Iron & steel plants.
CASTRES	29,133	Machine tools.
CAUDERAN	22,990	
CAVAILLON	12,522	Fruit.
CENON	10,087	
CERET	5,118	
CHAMALIERES	8,564	Indust.
CHAMBERY	28,073	Dairies, distilleries, metal rolling mill.
CHARLIEU	5,038	
CHATEAURENARD	8,695	
CHAZELLES-SUR-LYON	6,003	
CLERMONT-FERRAND	101,128	See main paragraph.
CLERMONT-L'HERAULT	5,426	
COGNAC	16,305	Many distilleries.
CONDOM	6,233	Brandy-trade.
COURS	5,706	
COUSTRAS	5,281	
CREST	5,513	
DAX	13,056	Spa.
DECAZEVILLE	12,365	Iron & steel plants.
DECINES-CHARPIEU	6,078	Synthetic fibres.
DIGNE	7,623	Distilleries, dairies.

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Appendix "F"

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TOWN	POPULATION	REMARKS
DRAGUIGNAN	12,130	
FIGEAC	5,889	
FIRMINY	20,257	Coal, armaments, munitions, iron & steel plants.
FLOIRAC	7,024	Cement.
FOIX	7,006	Agri.
FONTAINE	7,073	
FREJUS	9,441	
FRONTIGNON	6,243	Oil refinery and storage.
GAILLAC	7,779	Wine.
GAP	13,600	
GARDANNE	7,334	Alumina plant.
GIVORS	13,378	Machine tools, iron & steel, locomotives.
GRASSE	20,481	Olive oil.
GRAULHET	8,224	Leather.
GRENOBLE	95,806	See main paragraph.
GUERET	8,789	Distilleries, wineries.
HASPARREN	5,260	Cattle.
HENDAYE	6,436	
HYERES	26,378	Agri.
ISSOIRE	6,421	Alloy plant.
ISTRES	7,286	Plane repairs,
IZIEUX	9,727	Rayon.
LA CIOTAT	13,428	Dockyards.
LA GRAND'COMBE	12,343	Coal.
LA ROCHELLE	47,737	Canneries, distilleries, dairies, fishing (2045 fisherman), oil storage, plane parts.
LA RICAMARIE	10,162	Iron & steel plants.
LA SEYNE-SUR-MER	27,073	Commercial shipyard, chemical factory, armaments & munitions.
LA TESTE	9,496	
LA TRONCHE	5,602	
LAVAU	5,502	
LE BOUSCAT	17,653	
LE CANNET	10,056	
LE CHAMBON-GEUGEROLLES	14,802	
LE COTEAU	5,626	
LE PUY	21,660	Lace
LE TIEL	8,029	
LEZIGNAN-CORBIERES	7,248	
LIBOURNE	19,491	Fishing
L'ISLE-SUR-LA-SORGUE	6,505	
LIMOGES	95,217	See main paragraph. Engine assembly.
LIMOUX	8,193	Wine.
LODEVE	6,135	Cloth making.
LOURDES	11,529	Marble & slate quarries.
LUNEL	7,665	
LYON	570,622	See main paragraph.
MANOSQUE	5,635	Agri.
MARMANDE	10,481	

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TOWN	POPULATION	REMARKS
MARSEILLE	914,232	See main paragraph.
MARTIGUES	10,489	Fishing.
MAZAMET	15,447	Leather.
MENDE	6,499	
MENTON	21,703	Agri.
MERIGNAT	17,034	
MILLAU	16,437	Leather.
MIRAMAS	6,594	
MOISSAC	8,105	
MONTAUBAN	32,025	
MONTBRISON	7,756	
MONT DE MARSAN	13,009	
MONTELMAR	15,187	Nougat manufacture.
MONTPELIER	90,787	See main paragraph.
NARBONNE	30,047	Honey production.
NERAC	5,929	
NICE	241,916	Canneries, distilleries, dairies, cold storage plants, plane parts.
NIMES	93,758	
OLLIVIES	5,326	
OLORON-SAINTE-MARIE	10,300	
ORANGE	12,946	
ORTHEZ	6,175	Agri.
OULLINS	16,734	
OYONNAX	10,166	
PAMIEERS	14,035	Chemicals, iron & steel plants.
PASSY	5,915	
PAU	40,451	Distilleries, dairies, armament & munitions.
PAUILLAC	5,452	Oil refinery.
PERIGUEUX	37,615	Canneries, distilleries, dairies, machine tools.
PERPIGNAN	72,207	Many dairies, distilleries.
PERTUIS	5,229	
PESSAC	13,004	
PEZENAS	6,937	
PIERRE-BENITE	5,240	
PORT-DE-BOUC	6,163	
PRIVAS	7,733	Agri.
REVEL	5,362	
RIOM	11,425	Gliders
RIORGES	5,118	
RIVE-DE-GIER	14,483	Iron foundries, glass making.
RIVESALTES	5,009	
ROANNE	41,460	Textiles, armaments and munitions.
ROCHEFORT	29,482	Plane parts.
ROCHE-LA-MOLIERE	8,836	
RODEZ	18,450	Flour mills, Agri.
ROMANS-SUR-ISERE	19,489	
ROQUEBRUNE-CAP-MARTIN	6,133	
ROYAN	12,192	
SAINT AFFRIQUE	6,881	
SAINT CHAMOND	14,711	Coal, synthetic fibres, armaments, munitions, iron, & steel plant.
SAINT ELOY-LES-MINES	6,853	

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TOWN	POPULATION	REMARKS
SAINT ETIENNE	190,236	See main paragraph.
SAINT FLOUR	5,384	
SAINT FONS	10,443	Explosives, plastics.
SAINT FOY-LES-LYON	5,335	
SAINT GAUDENS	6,385	Oilfield nearby.
SAINT GILLES	5,325	
SAINT GIRON	6,406	
SAINT JEAN-D'ANGELY	6,728	
SAINT JEAN-DE-LUZ	7,804	Fishing (1,854 men).
SAINT JEAN DE MAURIENNE	5,201	Aluminum and electrodes.
SAINT JUNIEN	10,375	Paper.
SAINT LEONARD-DE-NOBLAT	5,754	
SAINT MARTIN-D'HERES	5,633	
SAINT MEDARD-EN-JALLES	5,144	Explosive plant.
SAINT PRIEST	5,336	Rubber.
SAINT RAPHAEL	9,635	
SAINT REMY	6,723	
SAINT YRIEIX-LA-PARCHE	7,302	China-clay quarries.
SAINTES	21,160	Distilleries, machine tools.
SALIES	5,362	
SALON-DE-PROVENCE	13,482	Indust.
SARLAT	6,982	
SETE	37,324	Fishing, explosives.
SORGUES	5,508	Explosive plant.
TARARE	10,395	
TARASCON	7,875	Chemicals.
TARBES	34,749	Canneries, distilleries, machine tools, armaments and munitions, engine assembly.
TASSIN-LA-DEMI-LUNE	6,750	
TERRENOIRE	5,781	
THIERS	16,181	Steel production.
THONON-LES-BAINS	12,183	
TONNEINS	7,044	
TOULON	150,310	See main paragraph.
TOULOUSE	213,000	See main paragraph.
TOURNON	5,658	
TULLE	15,617	Flour mills, armaments & munitions
UGINES	6,308	Steel production.
UNIEUX	5,650	
USSEL	6,269	
VALENCE (GIRONDE)	20,380	
VALENCE (DROME)	36,582	
VALLAURIS	10,554	Pottery.
VAULX-EN-VELIN	7,386	
VENCE	5,495	
VENISSIEUX	16,337	Aircraft, Armaments, Machine tools, rubber, electrodes, iron & steel plants.
Vienne	25,436	
VILLE FRANCHE (DROME)	36,582	
VILLE FRANCHE (RHONE)	18,871	Munitions, explosives, textiles.
VILLE FRANCHE (ALPES- MARITIMES)	5,014	
VILLE FRANCHE-DE- ROUERGUE	8,479	
VILLE FRANCHE-SUR-LOT	12,655	
VILLENAVE D'ORNON	6,764	
villeurbanne	81,322	Machine tools, Iron & steel, Electrical equipment, cars.
VIZILLE	5,160	
VOIRON	12,444	Paper
YSSINGEAUX	6,293	

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Appendix "F"

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APPENDIX "G"

STORAGE TANKAGE IN SOUTHERN FRANCE

<u>Location</u>	<u>Company</u>	<u>Tank Capacity M.T.</u>
BORDEAUX Region		
PAUILLAC	Jupiter Refinery	197,000+
"	Consommateurs	24,200
BEC D'AMBES	Gironde Refinery	129,000+
"	Docks	16,625
BASSENS	Standard	32,500
"	CIP	6,175
"	Desmarais	3,500
"	Produits de Naptha	12,700
"	PEN	14,800
"	Mazout et Derives	3,500
FLOIRAC	GIRONDE	1,874++
"	CIP	555
FURT (Villeneuve)	Standard	4,000
BEGLES	"	8,750
SAINTES	CIP	46
"	Standard	?
ROYAN	Standard	?
BAYONNE	Desmarais	500
"	CIP	145
"	Pyreneene	3,750
"	Standard	?
SETE and FRONTIGNAN	CIP	92,585
"	Midi	5,000
"	Centre	33,250
"	Standard	?
PORT ST. LOUIS DU RHONE	"	35,975
"	Jupiter	22,125
"	Lille, Bonniere	9,250
MARSEILLE Region		
MARTIGUES	Refinery of Cie Fran- caise de Raffineries	152,000
"	Marseillaise	6,500
BERRE	Refinery	190,000
L'AVERA	SGHP refinery	200,000
GREATER MARSEILLE	Standard	23,125
"	Jupiter	44,375
"	CIP	640
"	Desmarais	1,275
"	SGHP	6,250
"	Marseillaise	6,500
TOULON	Midi	750
"	Comb. Liquides	6,500
"	Standard	?
NICE	CIP	41
"	Demarais	1,000
"	Standard	?
ANTIBES	CIP	901
"	SGHP	2,375
Total seaboard area		1,300,046

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<u>Location</u>	<u>Company</u>	<u>Tank Capacity M.T.</u>
AIX LES BAINS	CIP	33
AGEN	Gironde	330++
"	Standard	?
ALBI	CIP	102
AUCH	Standard	?
AVIGNON	CIP	385
BERGERAC	CIP	18
BRIGNOLES	CIP	59
BRIVES	CIP	?
BEZIERS	CIP	61
"	Standard	?
CARCASSONNE	CIP	609
CASTELNALDARY	Standard	?
COLLIOURES	Standard	?
CLERMONT-FERRAND	CIP	56
CUSSET	CIP	36
DAX	CIP	26
"	Standard	?
GAP	CIP	62
GRENOBLE	CIP	369
"	Standard	?
LA GARDE	CIP	55
LAMALON	CIP	57
LANGON	Standard	?
LATESTTE DE BUCHE		24
LE PUY	Standard	?
LEVION	Standard	?
LIMOGES	CIP	418
"	Standard	?
"	Gironde	80++
LYON	CIP	5,833
"	Standard	3,125
MENDE	Standard	?
MONTELMAR	CIP	70
NIMES	CIP	124
NARBONNE	Standard	?
PAU	CIP	31
"	Gironde	43++
PERIGUEUX	CIP	64
PONTARLIER	CIP	118
ST. ETIENNE	CIP	107
"	Standard	?
TARBES	CIP	62
"	Standard	?
TOULOUSE	CIP	2,587
"	Gironde	330++
"	Standard	1,625
TREMBLADE	Standard	?
TULLE	CIP	143
VALENCE	CIP	76
VILLENEUVE of LOT	Standard	?
VILLEURBANNE	CIP	395
VIENNE	Standard	?
VOGLANS	Standard	?
VOLX	CIP	57

+ Partly destroyed.

++ White products only.

17,537

1,317,583

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Appendix "G"

ANNEX "C"

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WEATHER CONDITIONS ON THE SOUTH COAST OF FRANCE

1. May is a month of transition from the disturbed weather during the winter to the almost static conditions that obtain from July onwards. This is evidenced by the great decrease in the number of depressions that affect the Gulf from the maximum number of 4, on the average, during February through 1 in May to zero in July. It may also be noted that this single depression makes itself felt for only one day when both considerable wind and rain occur simultaneously. The occurrence of fresh or strong NW winds of the mistral type are not necessarily associated with the passage of depressions but more the extension of the AZORES anti-cyclone to the PYRENEES and at the same time intensified at its outer edge which lies over the RHONE VALLEY. This, coupled with the strong funnel effect inherent in a chasm, is sufficient to produce these abnormal winds.

WINDS.

2. The prevailing winds of the GULF OF LIONS fall into two definite groups: the mistral from the NW to N and the marin from the SE to E. It has been pointed out that the nature of the country marks the ILE DU LEVANT as the natural point of separation between these two prevailing types. Winds from other directions are relatively unimportant and are also of short duration. The other notable feature influencing the winds in May is the increase in those with a southerly component which is brought about by the heating of EUROPE and the introduction of a small scale monsoon effect.

3. The average number of days during May when winds of different direction greater than Force 2 are experienced is shown in the following table.

<u>Place</u>	<u>NE</u>	<u>E</u>	<u>SE</u>	<u>S</u>	<u>SW</u>	<u>W</u>	<u>NW</u>	<u>N</u>
CAPE BEAR	0	0	1	0	0	0	4	1½
CETTE	0	0	1	0	0	0	5	0
CAPE CROISSETTES	0	1	1	0	0	1	3	0
CAPE SICIE	0	1	0	0	0	2	3	0
ILE DU LEVANT	½	3	0	0	0	3	1	0
CAPE CAMARAT	0	2	0	0	1	½	1	0
CAPE FERRAT	0	1	0	0	1	1	0	0

The change from the NW to E is most marked from ILE DU LEVANT onwards.

4. From the above table it might appear that the incidence of strong winds is greater in the ILE DU LEVANT area than anywhere else. The ILE DU LEVANT, however, is more exposed than any of the other places from which observations are recorded. The above table therefore, should be used as a guide rather to direction than to strength of wind.

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Annex "C"

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5. The strength of winds may be judged from the following table, which shows the average number of days during the month when winds of different strength may be expected:-

<u>Place</u>	<u>Beaufort Force</u>	<u>Number of days expected.</u>
GULF OF LIONS area }	0 - 4	23
	5 - 6	7
	7 -12	1
CAPE CAMARAT area }	0 - 4	24
	5 - 6	5
	7 -12	0
CAPE FERRAT area }	0 - 4	27
	5 - 6	3
	7 -12	0

6. There is therefore a marked decrease in wind strength eastwards from the GULF OF LIONS.

7. As regards the approach to the GULF OF LIONS from the South, the following data apply to the sea area from the seaboard of the GULF to the BALEARICS. The average number of days during May when the wind exceeds force 4 over the whole sea area is 7. This figure was derived from a study of weather charts for 12 years (1927-1938). During the most disturbed May over the whole 12 years the maximum number of occasions when the wind exceeded force 4 was 13. This maximum number should, however, not be expected unless April has been singularly free from disturbances.

8. Furthermore the average number of gales affecting the whole sea area southwards to the BALEARICS during May was between 2 and 3. These were almost entirely NW mistrals. The maximum number was 7, these being a mixture of mistrals and gales from other directions.

9. The sea breeze is well marked in the GULF OF LIONS during May in clear weather and may reach force 4-5. It is said to fall off rapidly from the coast and to be imperceptible outside the 10 mile limit.

FOG

10. The distribution of fog is very local. It generally appears in the early morning and is confined to the coast. At sea, fog is rarely observed on even 1 day in 100, so that the chance of sea fog may be ruled out completely. Mist, however, (i.e. visibility between 1 and 2 miles) is observed on about 7 days during May over the sea in the Gulf.

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Annex "C"

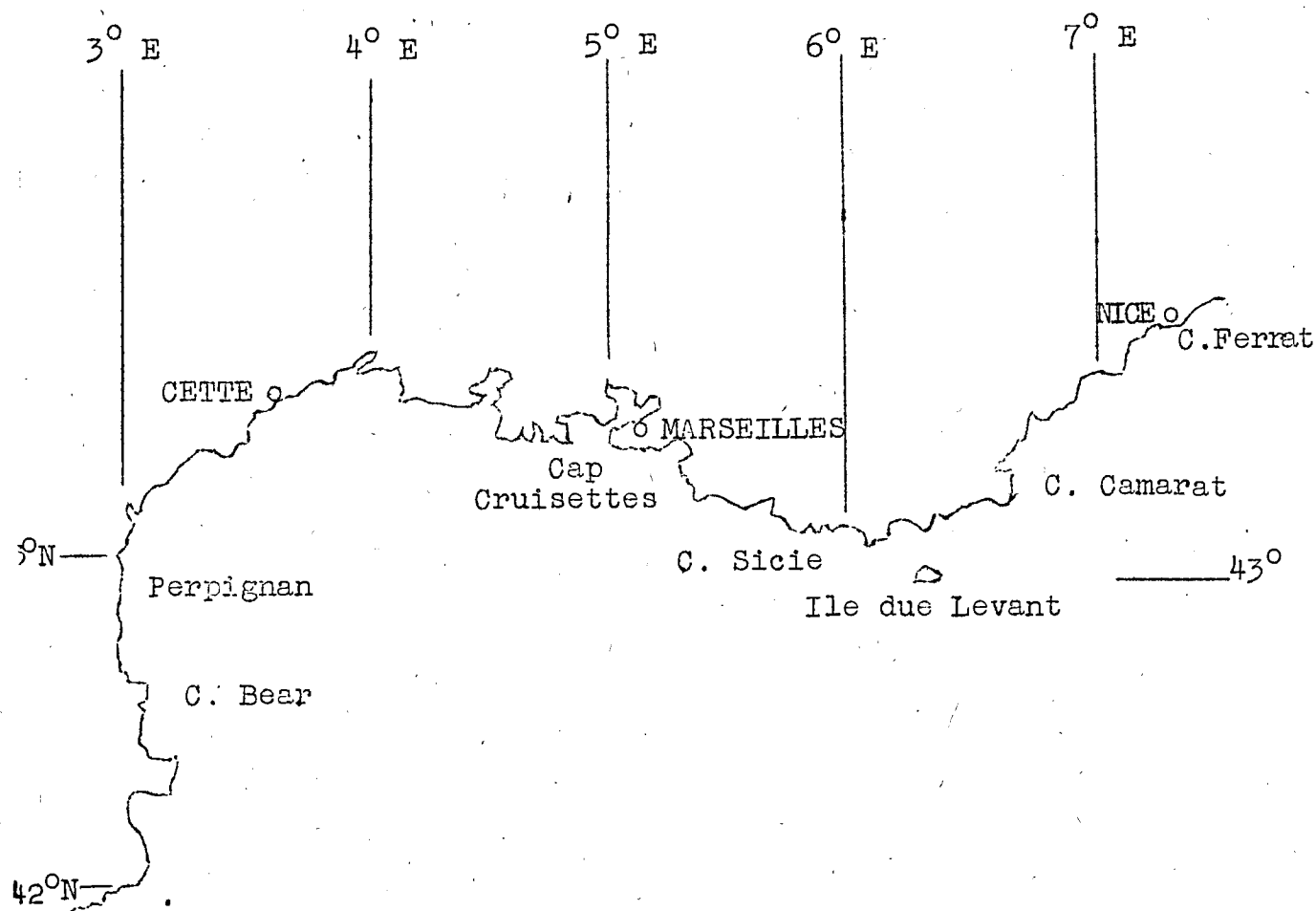
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11. Coastal fog is definitely greatest in summer. Statistics appear to indicate that coastal fog at dawn may be expected on 7 days during the month.

TEMPERATURE, RAIN AND CLOUD

12. Other climatological data for MARSEILLES are as follows:

Mean maximum temperature reached in the afternoon:	72° F.
Mean night minimum temperature:	51° F.
Average rainfall:	2 inches
Number of days when rain falls:	9
Number of days of overcast skies:	8



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Annex "C"

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ANNEX "D-1"

(One Photostat)

MAP OF BEACHES OF SOUTHERN FRANCE
(Cap Cavalaire - St. Raphael)

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Annex "D-1"

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EQUALS BRITISH MOST SECRET

BEACHES
CAP CAVALAIRE - ST. RAPHAEL

COPY NO. 1

LEGEND
ROCK'S OFFSHORE
EXITS
INFANTRY
MOTOR TRANSPORT
ARMOURD FIGHTING VEHICLES
ROCKY SHORE
SAND
SALTPANS
BEACH LIMITS
CLIFF

NOTE: The classification of beaches as "A", "B", or "C" is based on the amount of beach area available for the landing of troops and equipment. For details of actual obstacles to be overcome, and the quantities of beach material, reference should be made to detailed reports.

ANNEX "D-1"

BEACHES
SANARY-CAP CAVALAIRE

SECRET

COPY

SHEET 247 NE

SHEET 246 NW

SHEET 248 SE

Compiled by Beach Committee
AFHQ
Revised by AFHQ
Dec 1943

LEGEND
ROADS
EXITS
RAILWAYS
INFANTRY
MOTOR TRANSPORT
ARMOURD FIGHTING VEHICLES
ROCK'S OFFSHORE
SAND
BEACH LIMITS
CLIFF
ROCKY SHORE
SALT PANS

NOTE: The classification of beaches as "A", "B", or "C" is based on the amount of beach area available for the landing of troops and equipment. For details of actual obstacles to be overcome, and the quantities of beach material, reference should be made to detailed reports.

Compiled by Beach Committee
AFHQ

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ANNEX "D-2"

(One Photostat)

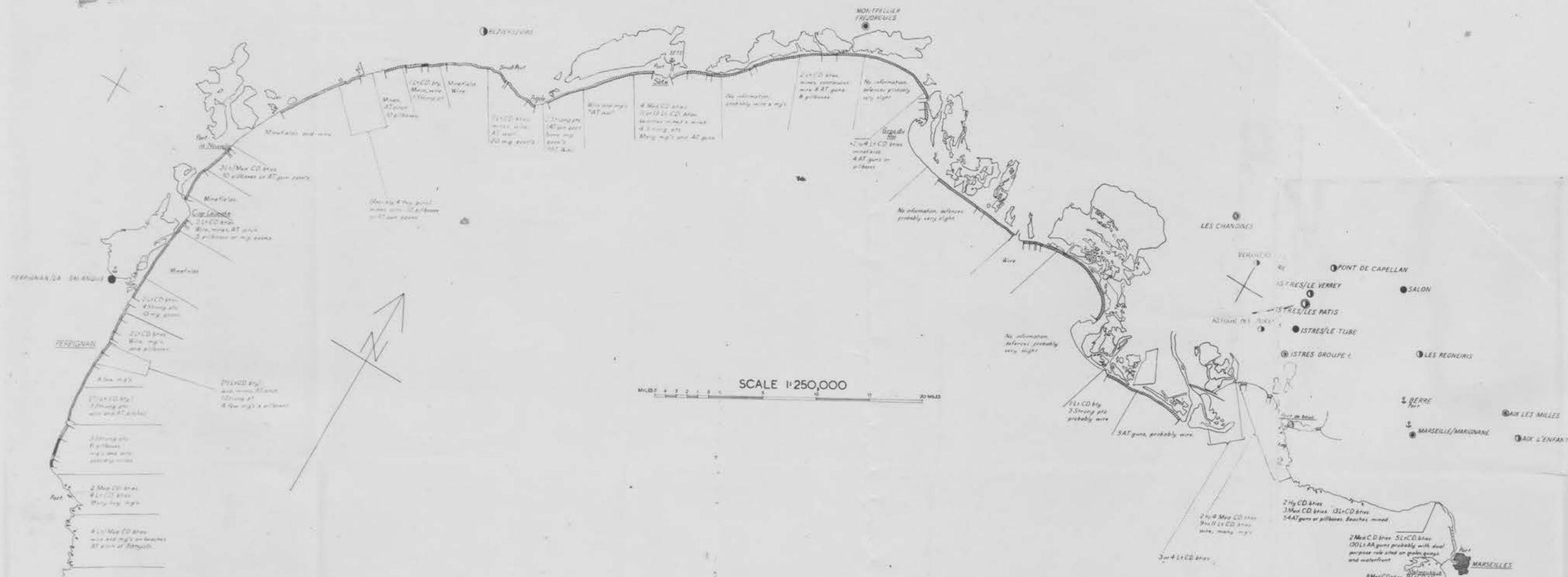
MAP OF BEACHES AND DEFENCES OF SOUTHERN FRANCE
(Port Bou - Port De Bouc)

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BEACHES AND DEFENCES PORT BOU - PORT DE BOUC

SECRET COPY NO
EQUALS BRITISH MOST SECRET



BEACH SYMBOLS

Good Beaches

Inferior Beaches

Inferior beach backed by an interior which is usually sandy or alluvial flats

Small scale and dingy landings

KEY TO AIR INFORMATION

Airfields

Landings Grounds

Fighters

Medium Bombers

Heavy Bombers

Seaplane Station

Lighting Area

BEACHES AND DEFENCES PORT ST. LOUIS - MENTON

SECRET COPY NO
EQUALS BRITISH MOST SECRET



BEACH SYMBOLS

Good Beaches

Inferior Beaches

Inferior beach backed by an interior which is usually sandy or alluvial flats

Small scale and dingy landings

KEY TO AIR INFORMATION

Airfields

Landings Grounds

Fighters

Medium Bombers

Heavy Bombers

Seaplane Station

Lighting Area

Drawn under direction of
Beach Committee AFHQ

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ANNEX "E"
(Sheet 1)

AIRFIELDS IN SOUTHERN FRANCE

SECTOR	NAME	CHARACTERISTICS	STATUS	REMARKS (DISPERSAL, ETC.)
AREA "A" 43°-44° N 4°-8° E	VAUVERT (Site)			
	NIMES COURBESSAC (Fi)	1100 N/S. 1100 E/W. Run - 1450	In Opns.	54 a/c visible - June. Shelter for 35 a/c.
	NIMES/GARONS (Site)	Under cultivation. 900 yds. sq.	Not in use.	
x	AVIGNON/PUJAUT (Fi)	1280 x 1060 yds.	Not in use (obstructed)	
x	AVIGNON/CHATEAU BLANC (MB)	N/S 1250, E/W 1100. L/R NW/SE 1700.	In Opn.	40 a/c when last photo was taken.
x	TARASCON (Site)		Obstructed	
x	MAS DE RUS (Fi)	N/S 1100, E/W 1000, L/R 1500		Satellite to ISTRES/LE TUBE
x	LES CHANOINES (Fi)	1300 x 1300, L/R 1500		Satellite to ISTRES/LE TUBE
x	TERRUSE (MB)	1250 N/S, 1250 E/W, L/R 1700.	In Opn.	
x	LE VALLON (Fi)	NNW/SSE 1050, NNE/SSW 1050	Obstructed.	
x	LA JASSE (MB)	1400 E/W, 700 N/S; NW/SE L/R - 1870 yds.	In Opn.	20 a/c visible. Good dispersal.
x	PONTE DE CAPELLAN (Fi)	NNW/SSE 1000 x ENE/WSW 900.	Obstructed.	Unknown.
x	ISTRES/LE TUBE (HB)	Unlimited in size. Runway 1900 NW/SE.	In Opn.	20 stands; 4 a/c shelters. Disp. indef. Over 100 a/c.
x	ISTRES/Group I (Fi)	N/S 1500; E/W 1100.	In Opn.	Dispersal ample.
x	ISTRES/LES PATIS (Fi)	NW/SE 1400; E/W 1000.	In Opn.	Dispersal ample.
x	VERGIERE/COLLONGUE (Site)	Abandoned.		

Annex "E"
(Sheet 1)

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ANNEX "E" (Cont'd)
(Sheet 2)

SECTOR		NAME	CHARACTERISTICS	STATUS	REMARKS (DISPERSAL, ETC.)
AREA "A" (cont'd)	x	RETOUR DES AIRES (F1)	NE/SW 1000; NW/SE 1000; L/R 1250.	In Opn.	Satellite to ISTRES/LE TUBE.
	x	SALON (HB)	NNW/SSE 2000, ENE/WSW 1750, L/R 2400.	In Opn.	Very large areas.
	x	PEYROLLES (Site)			
	x	LES REGNEIRIS (F1)	1300 E/W, 1100 N/S.	Obstructed.	Unknown.
	x	AIX/LES MILLES (MB)	NNW/SSE 1350, ENE/WSW-1000; L/R 1600.	In opn.	20 a/c seen 4 Oct.
	x	AIX/L'ENFANT (Site)	(?)	u/o. Obstructed Sept. 1	
	x	MARSEILLES/MARIGNANE (MB)	1600 x 1000; L/R 1750; R/W under/ cons. 700 yds complete.		Shelter 61. Dispersal unlimited.
	x	MARSEILLES/MARIGNANE (SPS)	Ample room.		
	x	BERRE (SPS)	Ample room.		
	x	MARS SOMATI (SPS)	(?)		
	x	LE VERRE (HB)	1300 x 1400 L/R 1950.		
		VINON (F1)	1300 x 1100 yards.	Obstructed by ditches.	
		ORAISON/LA BRILLANNE (Site)		(Obstructed by 3 trenches.	
		VALENTOLE/CATALANY (Site)	1000 x 1000	(May be cultivated. Unserviceable.	
		CUERS/PIERREFEU (F1)	1100 E/W 900 N/S; L/R 1300	Never used operationally.	
		HYERES/LE PALIVESTRE (F1)	1100 x 950 R/W conc. 1200.	Operations.	No organized dispersal. 42 a/c seen.
	"	" (SPS)	Ample room.	Operations.	18 N. Fighters.

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ANNEX "E" (Cont'd)
(Sheet 3)

SECTOR	NAME	CHARACTERISTICS	STATUS	REMARKS (DISPERSAL, ETC.)
AREA "A" (Cont'd)	TOULON/ST. MANDRIER (SPS)	Ample room.		
	LE LUC/GIRANDE BASTIDE (Fi)	1250 E/W x 1100 NW/SE.		
	FAYENCE (Fi)	900 x 850; L/R 1000.	Obstructed.	
	ST. RAPHAEL/FREJUS (Fi)	1350 NE/SW; 900 SW/NE. Conc. strip 200 yds x 40'.	Obstructed.	
	ST. RAPHAEL/FREJUS (SPS)	Ample room.		
	CANNES/MANDELIEU (Site)	900 x 700; L/R 1200.	Obstructed.	
	NICE/LA CALIFORNIE (Fi)	1200 x 350.	Not in use. 16 Aug. Obst. removed 20 Sept.	
	VILLE FRANCHE (SPS)			
	ANTIBES (SPS)			
	GOLFE JUAN (SPS)			
AREA "B" 42°-45° N 2°-4° E	RODEZ/ONET LE CHATEAU (Site)	660 L/R.	Obstructed by wide trenches.	
	IARZAC (Fi or MB)	1100 x 700; L/R 1650.	Obstructed.	No a/c seen.
	ALLU/LE SEQUESTRE (Site)	600 x 460; L/R 820.	Obstructed.	
	MONTPELLIER/FREJORQUES (HB)	1400 NW/SE; 1250 NE/SW; L/R 1850.	In Opn.	4, - Ju. 88.
	CASTRES/MAZAMET (Site)	Extended 2100 x 1200 x 1900; 600 x 870; each leg 175 yds. wide	In Opn.	40 seen.
	SETE (SPS)			
	BEZIERS/VIAS (Site)	600 x 600.	Obst. by ditches.	
	MONTREAL/BRAM (Site)			
	CARCASSONNE/SAL VAZA (Fi)	1100 x 550.	In Opn.	

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ANNEX "E" (Cont'd)
(Sheet 4)

SECTOR	NAME	CHARACTERISTICS	STATUS	REMARKS (DISPERSAL, ETC.)
AREA "B" (cont'd)	LEZIGNAN - CORBIERES (MB)	900 x 1200; L/R 1500.	In Opn.	138 a/c.
	PERPIGNAN/LA SALANGUE (Fi)	1100 x 1000.	Obst. by ditches	
	PERPIGNAN/LA SALANGUE (SPS)	Ample room.		
	PERPIGNAN/LLABANERE (Fi)	1100 x 650		2 areas for dispersal.
AREA "C" 44° - 45°N 4° - 6°E	VALENCE (Site)	1000 x 1000	Unlikely in opn.	
	MONTELMAR/ANCONE (Fi)	1200 x 1100.	Not in opn.	
	PIERRELATTI (Site)	1500 x 1070	Present opn. doubtful.	
	ASPRES-SUR-BUECH (Fi)	1100 x 600	Obstructed.	
	GAP-TALLARD (Site)	800 x 800	Obstructed.	
	SISTERON/THEZE (Fi)	1400 x 1000	Obstructed.	
	ST. AUBAN-SUR-DURANCE (Site)	800 x 250	Obstructed.	
	ORANGE/PLAN DE DIEU (MB)	1100 x 700; L/R 1600	In Opn.	
	ORANGE/CARITAT (MB & HB)	1500 x 1500; L/R 1900.	In Opn.	Ample area - over 40 a/c.
	AIRASCA (HB)	1900 x 1000	In Opn.	42 a/c seen.
AREA "D" 44° - 45°N 6° - 9°E	CAVOUR (Site)	1000 x 500.		None.
	SALUZZO (Fi)	1250 x 1000	In Opn.	10 a/c seen in July.
	POLONGHERA (Fi)	1400 x 600.		
	SANIGLIANO (Fi)	1300 x 330.		Aug. - 9 a/c seen.
	GOVONE (Site)	1250 x 550		
	GERVERE (HB)	1450 x 1250; L/R 2000		Nothing seen.

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ANNEX "E" (Cont'd)
(Sheet 5)

SECTOR	NAME	CHARACTERISTICS	STATUS	REMARKS (DISPERSAL, ETC.)
AREA "D" (cont'd)	LE NALDIGI/CENTALLO (HB)	L/R approx. 3500 x 700		34 seen in July.
	MONDOVI (MB)	1200 x 1150; L/R 1500	Not in opn.	
	AZZANO D'ASTI (Site)	1140 x 865		
	ALESSANDRIA (Site)	800 x 500		
	NOVI LIGURE (Fi)	1350 x 850		32 a/c - June 6.
	VILLANOVA D'AL BENGIA (Fi)	1330 x 790; R/W conc - 1180 yds.		
	BAGNASCO (EM) (Site)	350 x 250		
	SAMPIERDARENA (Fi)	1300 x 700		
	5 (SPS)			

CAPITULATION OF AIRFIELDS & SITES IN SOUTHERN FRANCE

AREA "A"	AREA "B"	AREA "C"	AREA "D"
3 Heavy Bomber	1 Heavy Bomber	1 Heavy Bomber	3 Heavy Bomber
5 Medium Bomber	2 Medium Bomber	1 Medium Bomber	1 Medium Bomber
17 Fighter	3 Fighter	3 Fighter	6 Fighter
9 Sites	5 Sites	4 Sites	5 Sites
9 Seaplane Stations	2 Seaplane Stations		5 Seaplane Stations

ABBREVIATIONS

x	Located in Marseilles Area	Site	Site
SPS	Seaplane Station	L/R	Longest Run
HB	Heavy Bomber	R/W	Runway
MB	Medium Bomber	a/c	Aircraft
	Fi		Fighter

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Annex "E"
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ANNEX "E"
(Sheet 6)

(One Photostat)

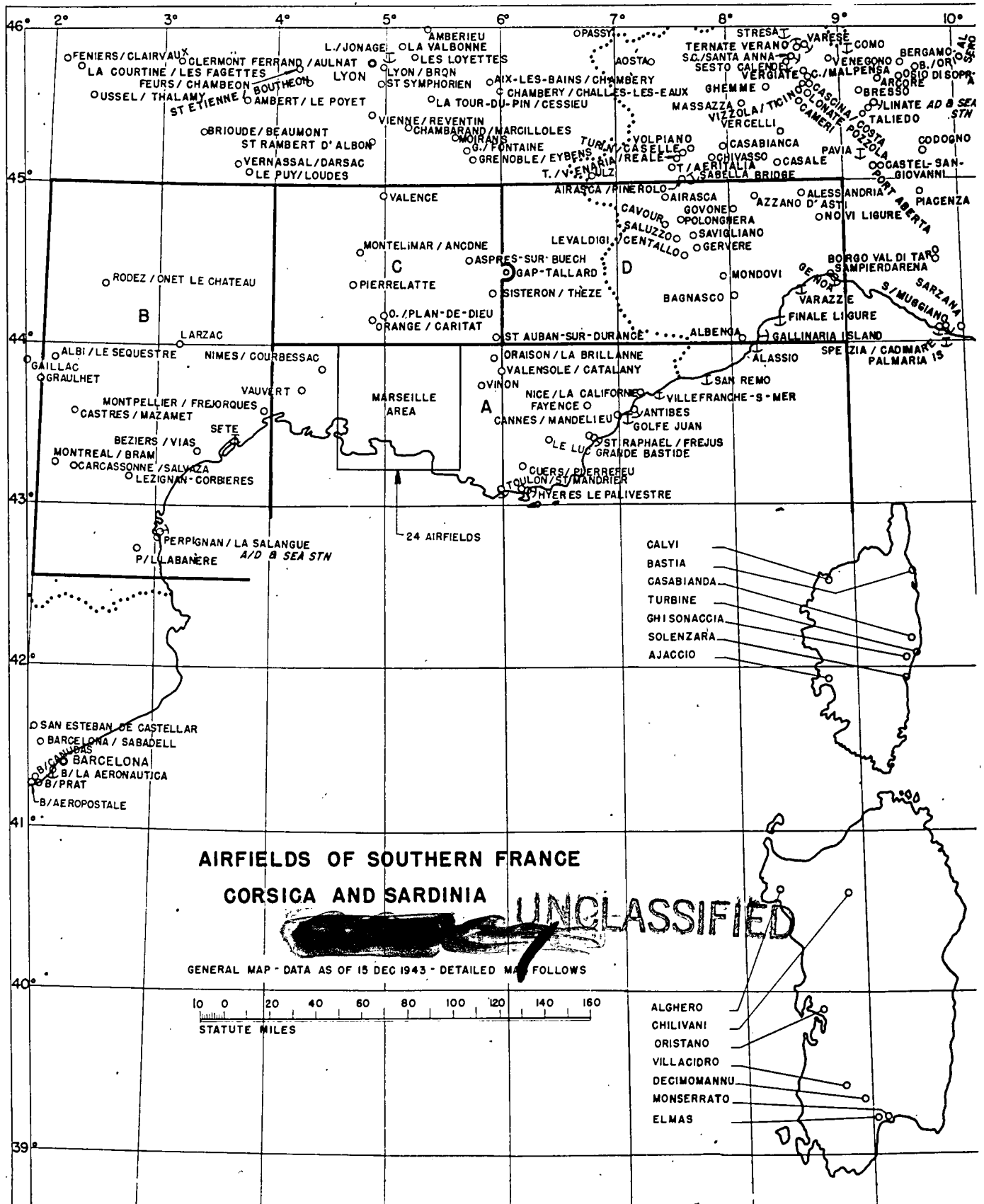
MAP OF AIRFIELDS OF SOUTHERN FRANCE, CORSICA AND SARDINIA

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Annex "E"
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ANNEX "E"
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ANNEX "F"

OPERATION "ANVIL"

THE G.A.F. DISPOSITION AND SCALE OF EFFORT

The estimates herein are based on the following assumptions:

1. That Operation ANVIL takes place at the same time as or immediately after Operation OVERLORD.
2. That the Allies are still fighting South of the PISA - RIMINI line.

I. Current Situation:

Within striking distance of the South coast of FRANCE are based the following aircraft:

Long Range Bombers	300
Long Range Reconnaissance	30
Coastal type	10
S.E. fighters (from training units)	40
Dive Bombers (from training units)	20
	<hr/> 400

NOTE: Single engine Fighter training pools and Dive Bomber training Schools in the MARSEILLES area could raise operational detachments in the strength indicated above in emergency. (This would only happen in the case of the dive bombers if Allied air cover were very weak.)

II. Reinforcements or Withdrawals.

a) In view of the varying factors of withdrawals for rest and refit, reinforcement commitments against operation OVERLORD - which the Germans must appreciate as the major operation - it is considered that the bomber force available will not materially alter. The disposition of the bomber force is almost certain to be changed, and it is likely that some of the bombers now at bases in North ITALY (more than half of the force available) will transfer to airfields in Central FRANCE, from which bases operations both against OVERLORD and ANVIL could be carried out.

b) The single engine fighter force (at present consisting only of training units) might be reinforced by some 120 aircraft including 30 fighter bombers and 90 single engine fighters. These reinforcements would be drawn from North ITALY and from refitting units in South GERMANY.

c) In general, therefore, no serious redisposition of the G.A.F. is likely to take place as a result of the ANVIL operation and it is considered that it will draw no substantial forces away from OVERLORD.

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d) G.A.F. strength at the beginning of or immediately after the launching of the attack is thus estimated as follows:

Long Range Bombers	300
Long Range Reconnaissance	30
Single Engine Fighters	
(1st line)	90
(Training units)	40
	130
Fighter Bombers	30
Dive Bombers (Training units)	20
Coastal	10
	<hr/> 520

III. Estimated G.A.F. Reaction to ANVIL:

a) Maximum effort per 24 hours:

Long Range Bombers	150 Sorties
Fighter Bombers	50/60 Sorties
Single Engine Fighters	150/180 Sorties
Dive Bombers (possibly)	30 Sorties
Reconnaissance	10 Sorties
	<hr/> 390/430 Sorties

NOTE: The following must be borne in mind -

1. The Long Range Bomber force contains more than 100 aircraft which are purely anti-shipping aircraft (torpedo bombers and radio-controlled bomb carriers). Few bomber operations have recently been carried out by day (except in areas where no fighter defense was encountered) and the greater part of the effort will be at night, thus considerably reducing its effectiveness.
2. Allied bombing will at least disrupt G.A.F. organization in the South FRANCE area and may reduce the above maximum effort by up to 50%.

b) Intensive effort over a period of 4 to 5 days (average per 24 hours):

Long Range Bombers	75 sorties
Fighter Bombers	25/30 sorties
Single Engine Fighters	90/100 sorties
Dive Bombers (possibly)	10 sorties
Reconnaissance	10 sorties
	<hr/> 210/225 sorties

NOTE: Allied bombing may materially reduce this effort.

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Annex "F"

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c) Sustained effort over a period of weeks:

This is likely to be inconsiderable, comparable with current air operations in ITALY (varying generally between 50 and 150 sorties per twenty four hours) until the bridge-head is enlarged to such an extent that the battle approaches the operational radius of action of the main G.A.F. defensive forces further North.

NOTE: The recent G.A.F. operations against LEROS cannot be taken as a standard by which to assess possible G.A.F. scale of effort. As there was virtually no fighter opposition and little bombing of German airfields prior to or during the LEROS undertaking, the G.A.F. was permitted to operate at will, and decreases both in strength and effectiveness were very slight.

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ANNEX "G"

ENEMY NAVAL FORCES

It is considered unlikely that the enemy will bring into service any of the ex-French or ex-Italian units in his hands, except for small units (Torpedo boats and below) which he is likely to use as convoy escorts and for minelaying. The following table however shows what ships it would be possible for him to have in service in the Western Basin of the Mediterranean by next May.

1	2	3	4	5	6
TYPE	GERMAN UNITS ALREADY IN SERVICE	EX FRENCH	EX ITALIAN	NO IN COLS 3 & 4 WHICH ARE ALREADY EFFECTIVE AGAINST US	TOTAL WHICH COULD BE MANNED AND IN SERVICE BY NEXT MAY
CAPITAL SHIPS	NIL	3	NIL	NIL	NIL
AIRCRAFT					
CARRIERS	NIL	1	1	NIL	2
CRUISERS	NIL	1	2	NIL	3
DESTROYERS	NIL	15	7	1	12
TORPEDO BOATS	NIL	5	8	7	20
CORVETTES	NIL	8	3	9	20
E-BOATS	18	10	50	30	80

- NOTES:
1. The Capital ships are all dismantled.
 2. The ex-French "aircraft carrier" is a seaplane transport.
The ex-Italian carrier is a converted liner and lacks suitable aircraft.

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ANNEX "H"

DISPOSITIONS OF FORMATIONS AT APRIL 1 1944 FROM WHICH ANVIL FORCE MIGHT BE CHOSEN

Location (a)	Nationality (b)	Divs other than Armd (c)	Armd Divs (d)	Corps H.Q.'s (e)	Total (f)	Grand Total (g)	Remarks (h)	
ITALY	U.S.	3 Inf Div	1 Armd Div	II VI One * (?)	Five Inf Divs 1 Armd Div Three Corps HQ		*One additional Corps HQ due to arrive prob- ably in February	
		34 Inf Div						
		36 Inf Div						
		45 Inf Div						
		88 Inf Div						
	BRITISH	1 Inf Div	6 Armd Div 5 Cdn Armd Div	V X XIII Cdn Corps HQ	Eight Inf Divs One Mixed Div Two Armd Divs Four Corps HQ			
		5 Inf Div						
		46 Inf Div						
		56 Inf Div						
		78 Inf Div						
1 Cdn Inf Div								
8 Ind Inf Div								
FRENCH	4 Ind Inf Div		One	Three Inf Divs One Corps HQ	Eighteen Inf Div Three Armd Divs One Mixed Div	#This nomination not yet firm.		
	2 NZ Mixed Div							
	2 Moroccan 3 Algerian 9 D.I.C.# (?)							
POLISH	3 Carpathian 5 Polish		One	Two Inf Divs One Corps HQ	Eight Corps HQ			
N. AFRICA	U.S.	85 Inf Div			Two Inf Divs			(a) This HQ has requested that another US Div be dis- patched to this theater.
		One other (a) (?)						
	BRITISH	1 Armd Div	Two Corps HQs	One Armd Div				
	FRENCH	1 Armd Div			Two Inf Divs Three Armd Div One Mot. Div Two Corps HQs			
		7 Algerian (c)						
		8 Algerian (c)				(c) Date of readiness of these formations not yet finally es- tablished. Their readiness by 1 April will depend on com- pletion of rearmament and training program.		
1 Mot Div (Brosset) (c)								
MIDEAST	BRITISH	4 Inf Div (b)	10 Armd Div 31 Armd Div		Two Armd Divs One Inf Div		(b) If not employed for HERCULES	
CORSICA	FRENCH	4 Mtn Div					One Mtn Div	

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ANNEX "I"

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ADDITIONAL REQUIREMENTS FROM OUTSIDE MEDITERRANEAN THEATER

(This list is only provisional and is subject to amendment as a result of detailed planning. Except in the case of assault shipping and craft as shown under "NAVAL", requirements, details are purely informative. Formal requests for provision will be submitted when more detailed planning permits.)

NAVAL.

The Naval requirements to permit a three divisional assault in ANVIL which are not at present allotted to the MEDITERRANEAN as a result of the SEXTANT decisions and of the return of the LST from INDIA are as follows:

15 LST
15 LCT
4 Escort Carriers
29 AA Escorts

For a two divisional assault the requirements would be:

4 Escort Carriers
20 AA Escorts

If however, detailed planning shows that the escort carriers are not required, the AA escorts can be reduced by 10 in each case.

AIR.

In addition to the Air Force units now in this Theater and not under consideration for withdrawal, additional Air Force requirements for Operation ANVIL are as follows:

- a. The 3 P-38 Groups and 2 P-39 Groups now being considered for withdrawal from this Theater to remain, to permit a minimum of 3 long range fighter Groups of 15th Air Force to be used to provide fighter cover during assault phase.
- b. Two Groups of the 52nd Troop Carrier Wing to remain. The alternative is one Group of the 52nd Troop Carrier Wing to remain and a minimum of 50 additional troop carrier aircraft and crews, dispatched to arrive in this Theater not later than 1st March 1944.
- c. That part of the 15th Air Force bombing effort necessary to create conditions favorable to a successful assault will be allocated to ANVIL on first priority beginning six weeks prior to D Day.
- d. One fighter control ship will be required.

GROUND.

Details of additional troops required are not included in this Annex.

Requirements in this respect are now the subject of negotiations between AFHQ and WASHINGTON.

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Annex "I"

SHIPPING.

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1. MT and MT/Store shipping requirements in terms of loadings in each thirty day period is given below (Plan A is for two division assault; Plan B is for three division assault with allocation of additional craft):

Period	Total Requirements		SEXTANT Allocation	Additional Requirements		Remarks
	Plan A	Plan B		Plan A	Plan B	
Pre-loaded for D, D+1, D+2 Convoys	147	153				
First Thirty Days	120	120				
TOTAL	267	273	128	139	145	See note (a)
Second Thirty Days	120	120	90	30	30	
Third Thirty Days	80	40	75	5	Reduction of 35	
GRAND TOTAL	467	433	293	174	140	

NOTE: (a) Estimated that, of the total number of loadings, 40 ships from assault and immediate follow-up convoys will be available for a second trip in first thirty days.

2. Above assumes LST allocated to ANVIL are not withdrawn until build-up is complete.

3. In subsequent periods Stores shipping will be reduced to a maintenance basis.

4. Shipping requirements for the maintenance of ITALY will as far as possible be reduced below the allocated number for internal MEDITERRANEAN movement (other than ANVIL) in order to contribute to meeting the additional ANVIL requirements.

5. By the maximum use of LST and craft and the staging of personnel before D Day in CORSICA, it is hoped to limit our personnel shipping requirements for the assault and immediate follow-up convoys to the SEXTANT allocation of 32,000 lift (in addition to lift in LSI and XAP). Requirements for lift in personnel shipping for subsequent follow-up convoys should not exceed the allotted 15,000 lift every ten days. Depending on the final plan this requirement may be reduced.

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Annex "I"

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ANNEX "J"

CALCULATIONS ON WHICH FIGURES FOR BUILD-UP ARE BASED

This annex is divided into two parts:

PART I

Contains the assumptions on which the calculations are based for the composition of army formations to be landed and for the availability, capacity, and turn-round times of ships and craft.

PART II

Shows how, with an assault of two divisions plus one RCT (Plan A), the force can be built up ashore as follows:

Two divisions plus one RCT ashore on D Day.

Four divisions ashore by D + 3 (@ 25,000 men and 4,000 vehicles per division).

Five divisions ashore by D + 12.

Approximately nine divisions ashore by D + 92 (@ 45,000 men and 8,000 vehicles per division).

This build-up requires:

(A) 100 MT or MT/Stores Ships to be pre-loaded in the Theater.

(B) 105 Ships for loading remainder of 1st 30 days.

120 Ships for loading 2nd 30 days.

53 Ships for loading 3rd 30 days.

PART I

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ASSUMPTIONS ON WHICH BUILD-UP FIGURES
ARE BASED

1. COMPOSITION OF FORMATIONS

<u>Army</u>	<u>Men</u>	<u>Vehicles</u>
Assault RCT (with Beach Group, AA, etc. complete)	8,000	800
Immediate follow-up RCT	4,400	750
Required to complete each assaulting division	4,600	1,650
U.S. Infantry Division	14,000	2,000
Proportion of Corps, Army and Service troops	11,000	2,000
U.S. Armored Division	11,000	2,600
Proportion of Corps, Army and Service troops	11,000	2,000

The above proportions of Corps, Army and Service troops per division are regarded as constant for a force of up to five divisions. For a force of 10 divisions, however, the divisional slice must be made up to a total of 45,000 men and 8,000 vehicles, and the figure increasing in proportion for forces between 5 and 10 divisions.

Air Forces

(These figures include proportions of Service Groups, but do not include Stores Depots).

Aviation Engineer Battalion	800	200
6 Fighter Squadrons	2,500	500
Reconnaissance Squadron	350	50
A-36 Group	1,600	380
P-47 Group	1,600	380
Beaufighter Squadron	250	30
Light Bomber Group	1,900	500
Medium Bomber Group	2,200	500
Air Support Command Headquarters	1,000	300

2. AVAILABILITY OF SHIPS AND CRAFT

LSI(M)	1
LSI(L)	9
XAP	3
AKA	6
LST	about 45
LCT (III & IV)	about 50
LCT (V & VI)	about 50
LCI (L)	about 90
LCM	265
Lift in Personnel Ships of	32,000

MT Ships	100 for pre-loading
	105 for loading remainder of 1st 30 days
	120 for loading 2nd 30 days
	53 for loading 3rd 30 days

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Annex "J"

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Assuming a 25 day turnaround of MT Ships the following sailings per 30 day period could be achieved:

	<u>NO. SHIPS</u>	<u>NO. SAILINGS</u>
Remainder 1st 30 days	105	126
2nd 30 days	120	144
3rd 30 days	53	64

After the assault original figures of serviceable craft are reduced as follows:

LST to 95% of original figures
LCT to 90% of original figures
LCM to 90% of original figures

3. CAPACITY OF SHIPS AND CRAFT

Vehicles and Stores

MT Ships carry approximately	120 vehicles (for assault and immediate follow-up convoys)***
LST carry	60 vehicles
LCT (II, III, & IV) carry	12 vehicles or 180 tons stores*
LCT (V) carry	10 vehicles or 150 tons stores**
LCM carry	1 vehicle or 15 tons stores
XAP carry	80 vehicles
AKA carry	200 vehicles

* Only 10 vehicles for a sea voyage

** Only 7 vehicles for a sea voyage

*** MT ships in subsequent follow-up convoys convey Maintenance stores in addition to MT

Personnel

XAP carry 1500
AKA carry 215
LCM carry 35
LCI carry 200 (for trips over 24 hours)
LST carry 350

Fitted MT ships carry an average of 300 men. In the first flight of MT ships a proportion of this number is required for Port Battalion personnel, and small boat crews leaving only 150 in each ship to be landed.

4. TURN-AROUND FIGURES

LST can be loaded from MT ships and discharged through beaches in 36 hours.

LCT can be loaded with stores in 12 hours.

Stores from LCT (II, III, & IV) can be discharged in 18 hours over beaches.

Stores from LCT (V) can be discharged in 15 hours over beaches.

LCT of all types can make 5 round trips between ship and shore in 24 hours when loaded with vehicles only.

LCM can make 10 round trips between ship and shore every 24 hours when loaded with vehicles only.

DUKWS can make 5 trips between ship and dump per day.

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Annex "J"

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5. CAPACITIES PER LCM

Each MT ship can carry 2 LCM and can unload them with own derricks. One "Dale" ship and one crane ship can carry 40 LCM between them.

6. STORES AND MAINTENANCE

It is expected that 700 DUKWS will be initially available. Allowing for unserviceability and daily maintenance it is estimated that 500 DUKWS will be continually available and will be capable of five round trips a day. It is considered that each DUKW will carry a minimum of 2-1/2 tons per trip.

In addition it has been assumed:-

- a. 5 large LCT per division are used for stores on the day of the assault.
- b. Subsequently a total of 10 small LCT used for landing stores (bridging equipment etc.) which are difficult to convey in DUKWS.

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PART II

BUILD-UP FOR PLAN A

PERSONNEL

ON D DAY it is required to land, in addition to Rangers:-

4 Assault RCT @ 8,000	32,000)Div A & B
3 Immediate follow-up @ 4,400	13,200)plus 1 RCT
1 Engineer Bn (Avn)	800 of Div C
	<u>46,000</u>
	<u>=====</u>
45 LST @ 350	15,750
46 LCI(L) @ 200	9,200
3 XAP @ 1,500	4,500
6 AKA @ 215	1,290
7 LSI(L) @ 2,000	14,000
7 MT Ships @ 150*	1,050
	<u>45,790</u>

*Allows for 150 personnel per ship for Port Bn. and small boat crews not included in above figures.

LSI(L) carry an average of 12 LCA per ship.

VEHICLES

ON D DAY it is required to land Divisions A and B plus 1 RCT of Division C:-

4 Assault RCT @ 800	3,200)Div A & B plus
3 Immediate follow-up RCT @ 750	2,250)1 RCT of Div C
1 Engineer Bn (Avn)	200
	<u>5,650</u>
	<u>=====</u>

Available Lift:-

40 Large LCT @ 10	400
50 Small LCT @ 7	350
45 LST	2,700
2 Ferry trips from merchant ships & combat loaders by 40 Large LCT @ 12	960
2 Ferry trips from merchant ships & combat loaders by 50 small LCT @ 10	1,000
Remainder cleared by LCM	240
	<u>5,650</u>
	<u>=====</u>

LCM carried into assault area as follows:-

By 3 special ships @ 20	60
" 6 AKA @ 6	36
" 3 XAP @ 2	6
" 7 MT Ships @ 2	14
	<u>116</u>
	<u>=====</u>

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PART II

BUILD-UP FOR PLAN A
(Continued)

PERSONNEL

In the 36 hours between PM D DAY and AM D + 2 it is required to land:-

To complete Div A & B	9,200
1 Infantry Div (less 1 RCT)(C)	9,600
1 Armored Division (d)	11,000
	29,800
<hr/>	
Carried in 60 MT Ships @ 150*	9,000
" " 44 LCI(L) @ 200	8,800
" " 2 LSI(L) @ 2,000	4,000
" " 4 Pers Ships @ 2,000	8,000
	29,800
<hr/>	

Total Army Personnel 75,000 (excluding Engr. Bn (Avn))

*Allows for 150 personnel per ship for Port Bn and small boat crews not included in above figures.

VEHICLES

In the 36 hours between PM D DAY and AM D + 2 it is required to land:-

To complete Div A & B	3,300
1 Infantry Div (less 1 RCT)(C)	1,250
1 Armored Division (d)	2,600
	7,150
<hr/>	

Between PM D DAY and PM D + 2 it is possible to discharge 60 MT Ships (7,150 vehicles). MT Ships carry 120 LCM. Following craft expected to be serviceable for ferrying the vehicles ashore:-

43 LST	
47 Large LCT	
35 Small LCT	
236 LCM	
5 trips each by 47 Large LCT @ 12	2,820
5 trips each by 35 Small LCT @ 10	1,750
10 trips each by 236 LCM @ 1	2,360
balance to be ferried by 1 trip each of 4 LST	240
	7,170
<hr/>	

Total Army vehicles 12,600 (excluding Engr Bn (Avn))

This releases 39 LST for ferry service PM D DAY. 6 of which are allocated to Air Force from CORSICA.

Annex "J"

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PART II
BUILD-UP FOR PLAN A
(Continued)

PERSONNEL

D + 2-3.

Required to land:-

Corps, Army and Service Troops for	
Div C & D	22,000
AA Defense for 2 Airfields	<u>1,000</u>
	23,000

Carried in 8 fitted MT Ships	
@ 150*	1,200
Carried in 25 unfitted ships	
@ 120	3,000
Carried in 10 Personnel Ships	
@ 2,000	<u>20,000</u>
	<u>24,200</u>

Total Army build-up by D + 3 97,000 (excluding
Engr Bn (Avn) and AA units for defense of air-
fields.)

* Allows for 150 personnel per ship for Port Bn.
personnel and small boat crews not included in
above figures.

The 120 personnel shown on unfitted ships are
vehicle drivers only.)

VEHICLES

D + 2-3.

Corps, Army and Service Troops for Div	
C & D	4,000
AA Defense for 2 Airfields	<u>200</u>
	4,200

To be unloaded by:-

5 trips of 47 Large LCT @ 12	2,820
5 " " 35 Small LCT @ 10	<u>1,750</u>
	4,570

Total Army Vehicles 16,600 (excluding Engr Bn
(Avn) and AA Defenses for airfields.)

Releases 4 LST to ferry air forces from CORSICA.

Annex "J"

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PART II

BUILD-UP FOR PLAN A
(Continued)

PERSONNEL

The build-up would then be arranged as follows:-

- (a) A personnel ship convoy of 15,000 personnel every ten days.

VEHICLES

The build-up would then be arranged as follows:-

- (a) 6 LST released on D DAY to be increased to 10 LST by D + 3 to ferry air force vehicles from CORSICA, SARDINIA and SICILY to complete a force of two A-36 Groups, two P-47 Groups, one Reconnaissance Squadron, one Night Fighter, one Light Bomber Squadron, one Medium Bomber Squadron, Airfield Defense and Air Support Hqs (Total approximately 3,000 vehicles.) by D + 25. (SEE NOTE)
- (b) About 33 LST, of which 27 are considered to remain continually operational, for ferry service from ITALY on a 10 day turnaround.
- (c) A convoy of 21 MT/Store Ships every five days from NORTH AFRICA beginning on D + 5 until D + 60 (exact date dependent of Mediterranean convoy cycle).

NOTE: It is considered that further Air Force requirements will occupy these LST's after D + 25. They are, therefore, ignored for purposes of calculating further Army build-up.

Annex "J"

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CORRECTED PAGE 120
TO
SECOND REVISED ANNEX J

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By D + 11 to 12 the following will be landed:-

	<u>Pers</u>	<u>Vehs</u>
Total Army Forces ashore by D + 3	97,000	16,600
2 MT ship convoys of 21 ships each	6,300	5,040
1 Personnel ship convoy	15,000	
1 LST convoy of 27 LST.	9,450	1,620
	<u>127,750</u>	<u>23,260</u>

Thereafter the build-up will be as follows until D + 62:-

1. To D + 62

Rate of Build-up for 10 day Period

	<u>Pers</u>	<u>Vehs</u>
a. It is estimated 27 LST will be maintained from ITALY on a 10 day turnaround	9,450	1,620
b. Two flights of 21 MT ships on five day cycle	6,300	5,040
c. A personnel ship convoy	15,000	
d. Personnel lift in LCI(L)	5,000	
	<u>35,750</u>	<u>6,660</u>

2. From D + 62 onwards:-

a. Same as a above	9,450	1,620
b. Two flights of 13 MT ships on five day cycle	3,900	3,120
c. A personnel ship convoy	12,000	
	<u>25,350</u>	<u>4,740</u>

This would provide build-up of forces as follows:-

ASHORE BY D + 12	127,750	23,260
D + 22	163,500	29,920
D + 32	199,250	36,580
D + 42	235,000	43,240
D + 52	270,750	49,900
D + 62	306,500	56,560
D + 72	331,850	61,300
D + 82	357,200	66,040
D + 92	382,550	70,780

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P A R T I I

BUILD-UP FOR PLAN A
(continued)

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This gives a force of 6 Divisions ashore by the time that the division from CORSICA has been ferried to the assault area. Subsequently the build-up could be as follows:

	<u>Rate of Build-up every 10 days</u>	
	<u>Personnel</u>	<u>Vehicles</u>
(a) It is estimated that out of the original 135 LCI it would be possible to maintain a ferry service of 80 LCI every 8 days. Equal to 16,000 personnel.	20,000	-
(b) Of the original 76 LST it is estimated that it will be possible to maintain a ferry service of 60 LST every 12 days, of which 12 are allotted to the Air Force ferry. 48 LST gives lift of 16,800 personnel and 2,880 vehicles every 12 days. (If, however, LST are required to proceed to another theater immediately the build-up is complete it would be necessary to withdraw one flotilla at a time for refitting in which case the figure for Army build-up would be reduced from 48 to 36. As this makes little difference to the overall build-up the possibility is ignored for planning purposes)	14,000	2,400
(c) 20 MT/Store ships every 5 days gives lift of 5,000 personnel and 2,400 vehicles.	10,000	4,800
Overall rate of build-up every 10 day period equals.....	44,000	7,200

Thus between D + 12 and D + 20 the following Army Personnel and vehicles will be loaded.

	<u>Personnel</u>	<u>Vehicles</u>
Total ashore by D + 12	190,100	31,770
80 LCI(L) lifts	16,000	-
32 LST lifts	11,200	1920
2 MT/Store ships Convoys @ 20	10,000	4800
Total by D + 20	227,300	38,490

Summary of build-up (excluding Air Forces) is as follows:-

D + 30	271,300	45,690
D + 40	315,300	52,890
D + 50	359,300	60,090
D + 60	403,300	67,290
D + 70	447,300	74,490
D + 80	Over 450,000	Over 80,000

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P A R T III

BUILD-UP FOR PLAN B

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For the execution of Plan B, an assault with three divisions, 15 LST and 15 LCT Mark V would be required in addition to the numbers available as the result of the SEXTANT decisions and of the return of LST and LCT from INDIA. This would give a total of 91 LST, of which 85 are assumed to be serviceable and 85 small LCT of which 65 are assumed to be serviceable.

The D + 1 - D + 5 follow-up will not be greatly affected by this increment, since it is limited by the number of preloaded MT ships rather than by the availability of ships and craft. It will, however, permit the division from CORSICA to be moved in earlier (since extra LST can be released at the end of D day for this service instead of waiting until the second flight of MT ships have been unloaded) and will increase the number of LST available for ferrying from NORTH AFRICA after D + 10.

The assault and follow-up would therefore be as follows:-

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Annex "J"

PART III

BUILD-UP FOR PLAN B

(continued)

PERSONNEL

ON D DAY it is required to land:-

6 assault RCT @ 8,000	48,000) Divisions
3 immediate follow-up RCT @ 4,400	13,200) A, B, & C
1 Aviation Engineer Battalion	800

62,000

Assuming 2 LSI(M) and 5 LST are used for Rangers, the following lift is available:-

80 LST @ 350 each	28,000
13 MT ships @ 150 each	1,950
9 LSI @ 2,000 each	18,000
3 XAP @ 1,500 each	4,500
Balance to be lifted in 48 LCI (L)	9,550

62,000

This leaves 62 LCI for follow-up.

VEHICLES

ON D DAY it is required to land:-

6 Assault RCT @ 800	4,800) Divisions
3 immediate follow-up RCT @ 750	2,250) A, B, & C
Aviation engineer Battalion	200

7,250

Available assault lift:-

15 large LCT @ 10 each	150
65 small LCT @ 7 each about	450
85 LST @ 60 each	5,100
A ferry trip from MT ships by 15 large LCT @ 12 each	180
A ferry trip from MT ships by 65 small LCT @ 10 each	650
5 ferry trips from MT ships by 60 LCM @ 1 each	300
Balance to be ferried in second trip by some of the LCT	420

7,250

(The above assumes that about 13 MT ships with 2 LCM's each and 2 special ships carrying LCM's accompany the force).

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Annex "J"

P A R T III

BUILD-UP FOR PLAN B.

(continued)

PERSONNEL

VEHICLES

In the following 3 days it will be possible to unload two convoys of 70 MT ships, each carrying approximately 8,400 vehicles, per convoy (as in Plan A). The following LST and craft are expected to be serviceable for ferrying them ashore:-

81 LST
27 large LCT
49 small LCT (allowing 10 to used for stores)
135 LCM

To ferry 8,400 vehicles ashore requires:-

5 trips each by 27 large LCT @ 12 each	1,620
5 trips each by 49 small LCT @ 10 each	2,450
10 trips each by 135 LCM	1,350
Leaving a balance to be ferried by 50 LST	<u>2,980</u>
	8,400

This leaves 31 LST free to leave the beaches p.m. D day to proceed to CORSICA to ferry one division and Air Forces from there.

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PART III

BUILD-UP FOR PLAN B.
(continued)

PERSONNEL

Between p.m. D day and p.m. D + 3 it is required to land:-

Personnel to complete assaulting divisions A, B, & C	13,800
1 Infantry division (D) with proportion of Corps, Army and Service troops	25,000
1 Armoured division (E) with proportion of Corps, Army and Service troops	22,000
AA defense for two airfields	1,000
Elements of another division and/or Service troops, say	<u>18,300</u>
	<u>80,100</u>
Carried in 70 MT ships @ 150 each	10,500
Carried in 70 MT ships @ 250 each	17,500
Carried in 62 LCI(L)	12,400
Carried in 2 personnel convoys totalling about 16 ships @ 2,000 each	32,000
Balance to be ferried from CORSICA in LCI(L)'s	<u>7,700</u>
	<u>80,100</u>

Total Army personnel ashore by D + 3: 140,300 (excluding Aviation Engineer Battalion and AA defense units for two airfields).

VEHICLES

Between p.m. D day and p.m. D + 3 it is required to land:-

Vehicles to complete assaulting divisions A, B, & C	4,950
1 Infantry division (D) with proportion of Corps, Army and Service troops	4,000
1 Armoured division (E) with proportion of Corps, Army and Service troops	4,600
AA defense for two airfields	200
Leaving balance available for elements of another division and/or service troops	<u>3,050</u>
	<u>16,800</u>

Total Army vehicles ashore by p.m. D + 3: 23,650 (excluding Aviation Engineer Battalion and AA defense units for two airfields).

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Annex "J"

P A R T III

BUILD-UP FOR PLAN B.
(continued)

PERSONNEL

The build-up would then be arranged as for Plan A.

- (a) Air Force Units are carried in LST allotted to Air Corps.
- (b) 21 LCI to ferry personnel of French division from CORSICA not carried in LST by D + 10 (two ferry lifts).
- (c) 60 LCI (assumed to be total remaining service-able) one trip from NORTH AFRICA.

Thus, between D + 3 and D + 10 the following Army personnel and vehicles would be added to the force:-

	<u>PERSONNEL</u>	<u>VEHICLES</u>
Total ashore on D + 3	140,300	23,650
2 MT/Store ship convoys	10,000	4,800
42 LCI lifts ex CORSICA	8,400	-
60 LCI ex NORTH AFRICA	12,000	-
54 LST lifts ex CORSICA	18,900	3,240
39 LST ex NORTH AFRICA	13,650	2,340
	<u>203,250</u>	<u>34,030</u>

VEHICLES

The build-up would then be arranged as follows:-

- (a) 7 of the 31 LST which left the beaches on D day to ferry fighter squadrons from CORSICA. After D + 3, LSTs on Air Force ferry to be increased to 12.
- (b) Remaining 24 of the 31 LST which left the beaches on D day to make 2 ferry trips for the French Division from CORSICA.
- (c) Another 6 LSTs to make one ferry trip to CORSICA to complete the lift of the French Division from CORSICA by about D + 10.
- (d) This leaves 39 LST to make one lift from NORTH AFRICA completing on about D + 10.
- (e) MT/Store ship convoys of 20 ships every 5 days as for Plan A.

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Annex "J"

P A R T I I I

BUILD-UP FOR PLAN B.
(continued)

From D + 10 onwards the rate of build-up will be as for Plan A, except that an additional 12 LSTs will be available giving an extra 3,500 personnel and 600 vehicles in each 10 day period -- i.e. 47,500 personnel and 7,800 vehicles every 10 days. This gives a build-up as follows:-

250,750 personnel	and	41,830 vehicles	by D + 20
298,250	"	49,630	" by D + 30
345,750	"	57,430	" by D + 40
393,250	"	65,230	" by D + 50
440,750	"	73,030	" by D + 60
Over 450,000	"	80,000	" by D + 69

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ADMINISTRATIVE APPRECIATIONOBJECT

To frame the policy for the maintenance of the forces to be engaged in Operation ANVIL.

A. THE EARLY STAGES1. Forces Involved.

The forces involved are estimated at two or three U.S. Divisions in the assault, with a build-up to ten divisions. These will be possibly seven French Divisions and three U.S. Divisions. Two of the French Divisions employed may be armored. One or more of the divisions may be employed in mountain warfare. The total forces of between 400,000 and 450,000 men will require to be supported through a port or ports. The provision of Service Troops is a French-U.S. matter and is the subject of a separate study. (See Annex "I")

2. Composition of Initial Divisions.

At Annex "J" are details of the build-up which proposes 125,000 Army Troops ashore by D + 3 consisting of five divisions, one of which is armored. The "divisional slice" is taken at 25,000 of which 14,000 comprise the actual division and 11,000 comprise corps and Army Troops, Beach Groups and other types of Service Troops. The actual composition of the 11,000 is a matter of detailed planning but is assumed to include:

- a. Some armor.
- b. Artillery and anti-aircraft.
- c. Beach Groups.
- d. Other auxiliary units, preponderantly service and transportation units.

It is considered that the "divisional slice" of 25,000 is self-sustaining for exploitation of a maximum of 20 miles which will cover capture of Toulon (estimated at D + 5). Immediately on the capture of Toulon, the proper service troops should be landed in the harbor where early steps are taken to put the port into use. It is estimated that the port can be put into operation four days after arrival of the additional service troops. In the meantime, all maintenance must continue over the beaches. On this basis, although exploitation may prove possible initially beyond Toulon in the most favorable circumstances, it should not be counted on until the port has been put into operation, i.e. about D + 10 or 12.

While the planning figure of 25,000 for a "divisional slice" is acceptable for the initial assault, it limits exploitation to a radius of some 20 miles. On the capture of Toulon considerable additional service troops are required to support further exploitation. The "divisional slice" will thereafter rise as extra service troops are added. Experience in this theater indicates that a proper "divisional slice" is 45,000 troops and 8,000 vehicles for a period of extended operations.

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3. Beach Maintenance.

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a. Requirements.

The proposed build-up in Annex "J" is on an alternative basis of two or three division assault. On the basis of 25,000 men per division in the assault, a fair planning figure is 800 tons per day per division for maintenance. This figure includes normal requirements with an additional allowance for losses and for such items as special Engineer Stores, special transportation needs, pipeline to airfields and special air requirements. After the initial landings have been made and the bridgehead has been secured, the figure of 800 tons/day/division can be reduced somewhat. It is considered that by D + 10 the tonnage per division per day can be reduced to 760 tons. On this basis the following is a forecast of daily tonnage to be discharged up to D + 20:

Convoy	Discharge by	Maintenance	T o n n a g e s			
			Ground Forces	Air Forces	Total	Per Day
PLAN A (Two division assault)						
D/D + 3	D + 5	D + 7	27,200	900	28,100	5620
D + 5	D + 10	D + 14	30,040	2,700	32,740	6550
D + 10	D + 15	D + 21	32,680	3,600	36,280	7260
D + 15	D + 20	D + 28	36,100	4,500	40,600	8120
PLAN B (Three division assault)						
D/D + 3	D + 5	D + 7	31,200	900	32,100	6420
D + 5	D + 10	D + 14	34,300	2,700	37,000	7400
D + 10	D + 15	D + 21	38,000	3,600	41,600	8320
D + 15	D + 20	D + 28	41,420	4,500	45,920	9180

b. Beach Groups.

In order to sustain the rapid rate of build-up of forces which is contemplated in the plan, it will be essential to secure an adequate bridgehead at the earliest moment, behind which the Beach Groups can deploy without undue interference from enemy fire, and well clear of the roads and area through which the follow-up divisions must pass. From this aspect the early capture of the Le Coudon feature (N.E. of Toulon) is essential. Without the necessary elbow-room for deployment, necessitated by the nature of the ground which is, on the Hyeres beaches, intersected by streams and irrigation ditches, it will be impossible for the Beach Groups to work to full capacity, or to take full advantage of the large number of DUKWs which are required to reduce beach handling.

It is considered that Beach Groups of approximately 5,000 personnel each can handle 1,500 tons per day at each of the assault beaches, provided that:

- (1) An adequate bridgehead affording space for deployment is established.
- (2) An adequate supply of DUKWs with spare trained drivers are available. (Action is being initiated to provide 700 DUKWs with appropriate spare parts for this operation).
- (3) Adequate labor and depot troops are landed early.

4. Maintenance of Special Forces.

Separate plans should be made for maintenance of any special forces used in this operation in order not to interfere with maintenance and build-up of the main forces. The troops

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employed in the capture of the islands covering the landing beaches must be put ashore with adequate maintenance in separately loaded ships. The Airborne R.C.T. must carry with it the supplies necessary to maintain it until the Ground Forces join it, plus a reserve to cover unexpected delays in junction of the forces. This may necessitate early arrangements for provision of the necessary supply landing equipment.

5. Tonnage Requirements.

After the bridgehead is secured and Toulon is in operation, the plan provides for the landing of ten divisions with appropriate service elements and exploitation for a distance of 225 miles. To maintain this force it is estimated that tonnage amounting to some 13,000-15,000 tons must be imported; these figures include allowance for transportation stores, coal, civil supplies, in addition to daily maintenance of Army and Air Forces.

In order to permit a rapid build-up tonnage capacity in excess of normal maintenance requirements will be needed. Furthermore, until pipelines or oil barges can be put into operation, there will be a heavy strain on inland transportation facilities which may adversely affect port clearance.

It is unlikely that Toulon port will be capable of handling the required tonnage even after several months of repair work. The only alternative is the early capture and use of Marseille. Anything that can be done to acquire the port of Marseille intact will be a most important contribution.

6. Ports.

The details of ports in Southern France are in Annex "A". In estimating practical capacity, reduction must be made, due to demolitions or obstructions, lack of rail clearance, and continued enemy air action. It is important that provision be made for early salvage of captured ports and the restoration of road and rail facilities in order to supply the forces involved.

It is estimated that some 2,000 tons per day could be unloaded at the outer berths in TOULON, assuming that the entrances to the inner harbor have been blocked and will not be workable for some time. The exits from the outer berths pass through a bottleneck and considerable clearance work may be necessary before advantage can be taken of any discharges at the quays.

Maintenance must continue over the beaches until Toulon is restored to capacity or an additional port put into use. Unless the Toulon dock area can be secured without serious damage, it is considered that temporary repairs only should be made here and that our main resources of port repair and development should be reserved for Marseille after its capture. If it appears possible, after detailed planning, to attempt to capture Toulon intact by use of a special force or French resistance group, the maintenance problem would thereby be greatly eased. In any event, the capture of Toulon is necessary to ease the problem of discharge but it is primarily a Naval port and not particularly suited for development as a main base.

Marseille is the best port in France and from an administrative viewpoint it should be captured as soon as possible, restored to use and developed as the main base port for the operation. When Marseille has been restored and put into operation, it has a capacity in excess of our requirements, but the limiting factor will be depot acceptance. For this reason provision must be made for adequate depot troops, well forward, in the Task Force troop list. There are numerous well drained open spaces near Marseille usable for dumps and parks for supplies and equipment.

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Annex "K"

B. LONG TERM CONSIDERATIONS

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1. Terrain and Communications. (See Annex "B")

a. Roads.

There is a comprehensive road net between Lyon and the south coast of France on both sides of the Rhone River. The roads are generally well constructed, main and secondary roads being tar macadam or surface treated macadam while the minor roads are generally ordinary macadam. The main road between Lyon and Marseille has a minimum width of 6 meters (19.7 ft.) and gradients do not exceed 6 percent. There are six major bridges over this route, some of which have a load capacity of only 16 tons. Some of the mountain roads retain old-style high crowns and are consequently unsuited to fast traffic. Minor roads through small towns and villages are generally very narrow and often cause traffic delays. Both suspension and stone-arch bridges are common in Southern France.

b. Railways.

Details as to railways in the area are in Annex "L".

In view of experiences in Italy it is assumed that railway demolitions will be thorough. Railways are highly vulnerable owing to the number of bridges and tunnels. A major problem will be the provision of sufficient locomotives to move our supplies once the railways or ports thereof are restored to use.

c. Inland Waterways.

The Rhone River between Lyon and the Mediterranean Sea normally carries a considerable tonnage. The Rhone River has a minimum draft of 6 feet and is open between Lyon and the sea, but the delta area contains many levees that might be destroyed or blocked. The swiftness of the river reduces its value as an inland waterway. The comparative ease with which the canals can be destroyed and tugs and barges sunk, makes it unsafe to rely on the inland waterway system for any immediate relief of the transportation strain. It is anticipated that an insignificant number of tugs and boats will fall into our hands, so that any substantial use of the Rhone and its canals must depend on imported tugs or craft. Nevertheless, in the long run it will be advisable to bring in the necessary craft and tugs to take advantage of the inland waterways to ease the strain on other forms of transportation. If small tankers or oil barges could be found it would be possible to bring P.O.L. supplies up the river instead of constructing pipelines. Bulk storage facilities are available at several inland ports including Lyon and we could expect to find a portion of these in repairable condition.

2. Administrative Implications of a Joint French-U.S. Force.

a. Mounting the Operation.

The responsibility for mounting the operation should be assumed by AFHQ in accordance with the normal procedure in this theater. The actual loading of ships carrying French supplies ex North Africa should be accomplished by the French Forces. It is considered that U. S. Forces will not be available for this commitment.

b. Maintenance of Forces.

The Commander of the operation should be responsible

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for maintenance of all forces involved until bases are established for this purpose. He should be assisted by two complete staffs, one French and one U. S. Separate records and requisitions should be maintained but the procedure for maintenance should be identical except for certain items which the French expect to obtain locally and items peculiar to one of the forces. Centralized control of the loading and shipment of supplies and equipment from North Africa or elsewhere in this theater should be exercised by the CG, SOS, NATOUSA. French resources in North Africa must be prepared to supply and load requirements of French Forces engaged in this operation. Direct shipment ex U.S. for U.S. Forces should be planned as early as possible to avoid rehandling of supplies. Detailed phased requisitions should be in the hands of Pembark by D - 60.

In the Expeditionary Force the inclusion of British Air Force personnel will necessitate maintenance in the early stage of the campaign on U.S. ration scales and dependence on U.S. administrative services to the extent to which this is normally the responsibility of the British Army. As the campaign develops and the numbers of R.A.F. personnel increase, consideration should be given to placing them on British maintenance scales. This will, however, necessitate provision of certain British administrative units, which are unlikely to be readily available. Any maintenance requirements of the Royal Navy, e.g., for shore establishments at Toulon will also be a U.S. responsibility.

c. Communication Zone in France.

Except for holding actions along the Italian border and along our left flank it is expected that our Forces will be employed primarily in the Valley of the Rhone. The transportation and communication systems are not easily divisible into separate communication zones. French Forces involved in this operation will be using American equipment. Except for the language difficulty, there is no compelling reason for separate base installations for the French and U.S. Forces. It is considered that the language difficulty must be accepted. From the administrative point of view, it is desirable that the communication zone be organized as provided in FM 100-10, with a single Commander responsible for all normal functions of the communication zone. The details of organization and procedure for handling the distribution of supplies to the forces should be the subject of detailed planning.

3. Local Resources.

a. Industrial Resources.

The industry of Southern France is concentrated in the chief ports, and around three large cities which are 160 to 200 miles inland. These are: Lyon, St. Etienne, and Clermont-Ferrand. The bituminous coal deposits near Lyon and St. Etienne are most important, producing 4.1 million tons in 1941. The fields near Ales, 35 miles west of Avignon, are estimated at three to four million tons per year. The Trets Region near Marseille produces 1,200,000 tons of lignite coal a year, which is useful for local power but does not meet requirements for railroad operations. It is estimated that locomotive coal captured will not be sufficient for our needs, so that coal will have to be imported until the bituminous coal mines are captured and put into operation.

In the Toulon-Marseille Region there is now an excess of 650,000 metric tons of bulk storage capacity for P.O.L. supplies. It is estimated that 25% of this capacity will be intact or repairable. This amounts to 162,000 tons of storage which is considered adequate, but pipelines or oil barges will be required as our Forces advance.

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Annex "K"

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Production of goods for civilian consumption is at a very low rate at the present time. The plants are dependent on German allocations of electric power, coal, petroleum products, and raw materials.

An occupying force could expect to obtain quantities of aluminum, cement, and explosives, small amounts of silk, repair facilities for armored vehicles and planes, and certain amounts of iron and steel and French types of small arms and ammunition.

b. Agriculture and the General Food Situation.

The region is not self-sufficient in food production at this time. The food requirements of occupying armed forces in Southern France and certain additional supplies for the local population, chiefly wheat, would have to be imported. Food reserves are now very small, agricultural production is severely below the normal level, and military operations would probably interfere with food production and distribution. Based on an estimated rate of advance of from seven to ten miles per day, it is estimated that food, medical and sanitary requirements will amount to 1,000 tons per day by D + 20 and rise to 2,000 tons per day by D + 50. Civil supplies cannot compete with military requirement for operations, but there will be a commitment to feed the civilian population as soon as we have captured Toulon.

c. Labor Resources.

The normal population of the area would certainly provide sufficient labor for operations. Although labor resources are now greatly reduced, it is estimated that some labor can be obtained locally to supplement our own forces, provided food is imported for this purpose. It is considered that no local labor will be available until after the capture of the main ports. Recent reports of wholesale evacuation of the coastal area of Southern France must be evaluated at a later date.

4. Hygiene.

The public health situation in Southern France is poor. There is a shortage of hospital facilities, medical personnel, and all kinds of drugs and medical supplies.

All food and water require rigid inspection before use, and provision should be made for control of insect and rodent carriers of disease, and for unit disposal of sewage.

5. Cities.

The nine most important cities in the area under consideration which have a population of 90,000 or more are:

Marseille	914,200	Clermont-Ferrand	101,100
Lyon	570,000	Grenoble	95,800
Nice	241,900	Nimes	93,700
St. Etienne	190,200	Montpellier	90,900
Toulon	150,300		

Road distances between towns and cities in Southern France are shown in Annex "B".

6. Water Supply.

The numerous streams, springs, and wells of Southern France ordinarily provide adequate supplies of water. The annual mean rainfall in the Marseille-Toulon area is 22.5 inches.

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Annex "K"

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Most surface water and some underground water is polluted by animal and human waste, and must be sterilized before it can safely be used. The local population has apparently built up a considerable degree of immunity to infection from such ailments as diarrhea and dysentery, but to newcomers the danger from these diseases is acute.

Many of the cities and larger towns have modern water supply systems, and the water can be used with little fear of pollution. Among the major cities, Marseille has the most inadequate purification system, the only treatment being clarification in settling basins.

7. Climate.

Temperature at Marseille ranges from a monthly mean of 43° (F) in January to 72° (F) in July. Rainfalls relatively even throughout the year, averaging slightly less than two inches per month, except in July and August, when less than one inch falls, and in October and November when rains are heavy. Fog is not likely to be encountered except during December and January.

8. Effect of ANVIL on Operations in ITALY.

The withdrawal of formations now in Italy for amphibious training should be planned so that the maintenance of these formations imposes as little additional burden as possible on transportation resources. Training centers should therefore, be preferably located primarily in Sicily, secondarily near a base port in Italy.

It is anticipated that up to three assaulting and one follow-up divisions may be mounted from Sicily and Italy. The bulk of the stores would be loaded outside Italy.

Some interference will be inevitable to the discharge of M.T. and stores in Italian ports for a limited period. In view, however, of the probable state of reserves at the time of mounting the operation, and the state then attained of M.T. build-up, it is considered that mounting of up to four divisions in Sicily and Italy can be accepted without major prejudice to requirements of the forces in Italy.

It would have an adverse affect on operations in Italy if U. S. port operating or transportation units are withdrawn from Italy for participation in ANVIL, unless they can be relieved by similar units. Service troop requirements for ANVIL are being examined separately. It is considered that British units cannot be made available to replace U.S. port and transportation units now in Italy unless such units can be found from Middle East.

CONCLUSIONS

1. The first essential administrative requirement after landing is a firmly established bridgehead sufficiently distant from the beaches to provide security and space for deployment and operation of depots. To this end, the seizure of the Le Coudon Area on the left flank at the earliest moment would assist the deployment of the Beach Groups.

2. The ground in rear of the landing beaches does not facilitate rapid deployment of Beach Groups without preliminary Engineer work to provide crossings over ditches, railways and irrigation channels. Some areas in rear of the beaches are limited in extent by hills. The acceptance on shore of follow-up divisions at the quickest rate possible, as outlined in Annex "J",

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will therefore be dependent on two main factors: (1) the rapid establishment of an adequate bridgehead to afford deployment areas to the administrative services, and (2) the speed with which the Beach Groups can be deployed clear of roads and beaches, thus avoiding congestion of stores and vehicles.

3. The organization of Beach Groups, and the maintenance of the subsequent advance, will necessitate the provision of additional Service Troops beyond the resources of this theater. (These troops are specified in Annex "I").

4. By means of Beach maintenance, given above conditons, it should be possible to support the initial assault for a distance of 20 miles, which will cover capture of Toulon. Operation of this port will be necessary to facilitate further advance.

5. The early capture and operation of Marseille are necessary to provide a port through which our forces can be maintained. If operations are directed initially against Toulon, that port could be used until the capture of Marseille, which should be developed as the main base port for the operation.

6. It is considered that the mounting of up to four divisions from Italy and Sicily in landing craft and M.T. ships should be possible without critical interference to the requirements of forces in Italy at the time of embarkation.

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Annex "K"

ANNEX L

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1. OBJECT

To examine the probable availability of railways for this operation within a 250 miles radius of the main ports.

2. ASSUMPTIONS

a. The enemy will achieve demolitions on the scale now being encountered in ITALY.

b. The enemy will achieve at least part of this known plan in the event of an Allied landing (see below).

3. CONSIDERATIONS

a. Main Routes

- (1) ITALIAN frontier - NICE - TOULON - MARSEILLE.
- (2) MARSEILLE - AVIGNON - LYON - BELFORT (E. bank of RHONE).
- (3) AVIGNON - LYON - DIJON - BELFORT (W. bank of RHONE).
- (4) AVIGNON - NIMES - SETE - PERPIGNAN (Spanish border).
- (5) SETE - NARBONNE - TOULOUSE - LIMOGES (electrified).
- (6) MONT CENIS - MONTMELIAN - LYON (part electrified).

A sketch map is attached.

b. Enemy plan and Control.

The Germans have already withdrawn a large proportion of the skilled French railwaymen required to operate the lines concerned to full capacity. The former P.L.M. system employed at least 50,000 highly efficient railwaymen in this district. Of these, 1,500 specialists were demanded from the MARSEILLE area alone in October 1942.

The German plan in the event of Allied landings on the South coast includes the drastic reduction of railway operation to a skeleton service as they fear that the French railwaymen might strike. Thus all but a limited number of main lines will be closed and the locos and rolling stock withdrawn or destroyed. Only the BELFORT - BESANCON - LYON main line will be kept fully open being operated and guarded by German military personnel. A few other lines may be used for moving heavy guns and tanks with a military block system instead of the normal automatic signaling.

c. Vulnerability

Destruction of the lines and installations of the key centers of MARSEILLE, AVIGNON, LYON, MIRAMIR and NIMES would paralyze all traffic from TOULON and MARSEILLE inland.

The sketch map attached shows the major tunnels, bridges and viaducts which would probably have to be repaired before even a skeleton rail service could be operated.

d. Line Capacities

All the main lines under consideration are in peace time capable of handling 72 trains per day in each direction of at least 460 tons each. This is dependent on a high standard of track repair, modern signalling, fast locomotives and first class rolling stock.

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Annex "L"
(Sheet 1)

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Few of these conditions are likely to obtain in the first year after an Allied landing. The most important factors in reducing the probable line capacity will be (a) the reduced number of block posts that can be operated by military personnel and (b) the reduction in average train speeds due to installations and rolling stock damaged by enemy action or lack of repair.

When properly repaired and working under military block regulations all main lines should be able to handle 24 trains per day each way of 300 - 350 tons each or 8,000 tons per day in each direction. This is dependent on adequate rolling stock being available by the time each line is ready for traffic.

e. Possible opening dates for traffic

MARSEILLE - TOULON	minimum of D + 30
MARSEILLE - MIRAMIR	" " D + 60
MARSEILLE - AVIGNON	" " D + 90
AVIGNON - NIMES	" " D + 120
NIMES - MONTPELIER	" " D + 150
MONTPELIER-SETE	" " D + 180
AVIGNON - LIVRON	" " D + 150
LIVRON - LYON	" " D + 210

These estimates are based on present rates of reconstruction in ITALY. They would be considerably reduced in the event of the enemy being unable to effect complete demolitions in a quick withdrawal.

f. Bridging Requirements

It is estimated that a minimum of 10,000 lineal feet of single track railroad bridging will be required to open two rail lines between MARSEILLE and LYON (one on either side of the RHONE). This is based on Italian experience and provides for one crossing of the RHONE river.

4. CONCLUSIONS

a. Except for local dock clearance railways are unlikely to be available for operation in the early stages of the campaign.

b. The enemy plan includes almost complete withdrawal of all rolling stock, locomotives and French railway personnel in the event of an enemy landing. Unless, therefore, almost complete surprise is achieved use of the railways will be limited to what locomotives and rolling stock can be imported and operated by military personnel.

c. As soon as the railways can be opened for traffic they are capable of meeting all demands to support the expeditionary force. The two main lines to LYON on either side of the RHONE could each handle 8,000 tons per day as could also the route via SETE to TOULOUSE and W. FRANCE. Alternative routes to LYON exist (1) via ALES and ST. ETIENNE (2) via AIX and GRENOBLE.

d. The enemy plan to withdraw large quantities of rolling stock might be curtailed by the strategic bombing of the vital points mentioned in paragraph 3 c. (Vulnerability) above, in advance of D day.

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Annex "L"
(Sheet 2)

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ANNEX "L"
(Sheet 3)

(One Photostat)

RAILWAY MAP OF SOUTHERN FRANCE

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Annex "L"
(Sheet 3)

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ANNEX "M"

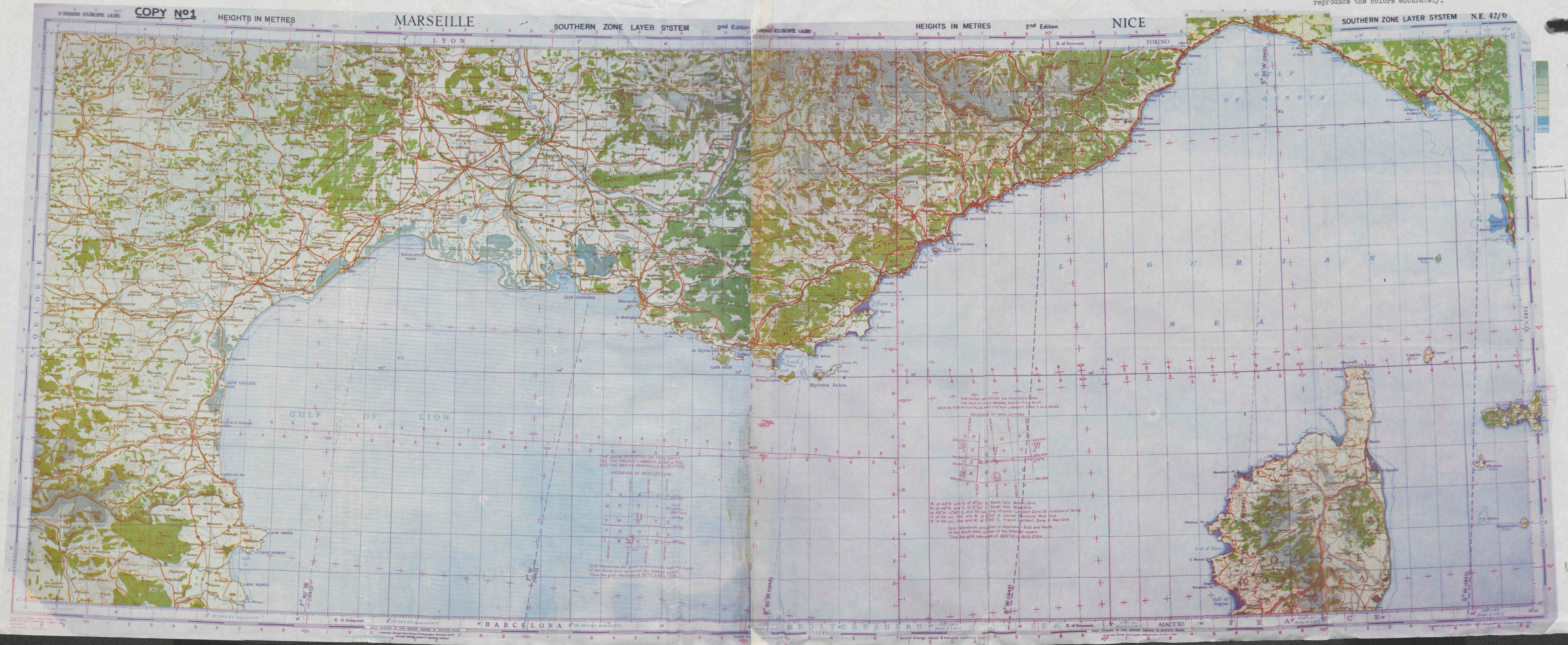
(One Photostat)

COLORED MAP OF SOUTHERN FRANCE

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Annex "M"

1. Annex "M", as reproduced by the Secretaries, is one-third smaller and less distinct than the original received from Gen. Eisenhower (Orig. on file with Sect.)
2. The altitude indication by tints is not reliable because of inability to reproduce the colors accurately.



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TO

C.C.S. 424/1

OPERATION "ANVIL"

Note by the Secretaries

All holders of C.C.S. 424/1 are requested to make the following correction thereto:

Page 12, subparagraph 18 c, first line, change
"D + 22" to "D + 2".

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REVISION OF ANNEX "J"

TO

C.C.S. 424/1

OPERATION "ANVIL"

Note by the Secretaries

Holders of copies of C.C.S. 424/1 are requested to substitute the attached Second Revised Annex "J" for the Annex "J" now attached to this paper. The First Revised Annex "J" has not been received by the Secretariat.

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